

AN INVESTIGATION INTO WAGE INCENTIVES AND THEIR
EFFECT ON PRODUCTION, WITH COMPARISONS
BETWEEN GREAT BRITAIN AND THE
UNITED STATES

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PREFACE

What is wrong with production in Great Britain?

I should have kept a tabulation of the number of times this question has been asked of me since my recent return from the United Kingdom.

In attempting to answer such an involved question, it was in most cases necessary to review the industrial scene from the viewpoint of Britain's economic background. At first, I was surprised to find how little the average American knows of the British situation, but then I recalled that in an address given by Sir Charles J. Bartlett at a meeting of leading members of management in the Glasgow area, he dwelt on Britain's economic background at length, and stated that "where we have failed, in a broad national sense, is in our lack of understanding even of the country in which we live and work and have our being."¹ How necessary it is that this be known!

¹"Some Industrial Problems of Today and Tomorrow," an address given at a meeting arranged by the Glasgow Branch of the Institution of Works Managers and kindred organizations on January 23, 1950.

It is hard for most Americans to realize that for six years Britain's productive efforts were concentrated entirely on the implements of war, and that during that period very little foreign exchange was being earned. Instead, the gold reserves of the country were almost exhausted, and foreign investments were sold to pay for the war effort.

If the United Kingdom contained all or nearly all the natural resources--as does the United States--the task of catching up on this six years arrears of production, and the task of raising the average level of living by producing a larger quantity and higher quality of goods and services would be relatively simple.

It must be remembered that coal is the only important reserve of which there is a surplus. Cotton cannot be grown in the country. Timber must be purchased abroad--90 percent of the timber required must be imported.¹ There is only a small amount of petroleum in relation to requirements. There is not enough iron ore;

¹"Building Materials Supply," Bulletin of the Department of Economics and Commerce and Social Studies, University College, Hull (England), December 1948, p. 3.

this and other metals and chemicals have to be imported. Not only is the country still importing substantial quantities of steel, but despite increased steel production, steel supply will continue to be a limiting factor in industrial expansion for some years to come.¹ The British farmers grow less than half of the food the country requires.

Having an excess in value of imports over exports is nothing new to Britain. Prior to the war only half of the necessary imports were paid for by giving something of equal value in return. The remainder was paid for by "invisible" exports--invested capital sent abroad during past generations. Foreign countries paid dividends and interest for the use of these investments, enabling the British to pay for almost one-fourth of what they needed from other countries. Foreigners paid large amounts for dispatching freight in British ships. Insurance and banking services also helped.

¹"First Report of the Committee on Industrial Productivity," Cmd. 7665, His Majesty's Stationery Office, London, 1949, p. 21.

Just prior to the war, average annual imports cost Britain 866 million pounds. They were paid for by visible and invisible exports, divided as follows:

	<u>Millions of Pounds</u>
Export of goods	478
Shipping services	105
Banking and Insurance	40
Income from investments	<u>203</u>
Total	826

The 40 million deficit was met by borrowing or through the sale of assets.¹

During the war most of the overseas assets were capitalized and very few sources of invisible income are now left. More than one billion pounds in foreign investments were disposed of for war supplies alone. The heritage from the more fortunate days of Britain has practically dried up. Everything has had to be put into the common fund for paying the debts of war. Instead of income, she has now become a debtor nation, owing some 3,000 million pounds, on which interest must be paid.

Britain now has "blocked sterling balances" to foreign countries, to which she will have to export

¹George Soule, America's Stake in Britain's Future (London: Oxford University Press, 1946), p. 22.

without getting anything currently in return. She also has to export enough more to pay for the imports needed for her daily life.

Economically, at the end of the war Britain was relatively weaker than many of the occupied countries, and weaker than she was before the war. At the same time America was left economically stronger.

Great Britain is an island country, and as we have seen, dependent upon world trade for its livelihood. Remembering that world trade divides itself into three main sections--raw materials, food, and manufactured goods, we can begin to see the situation of Britain today. She is a heavy exporter of raw materials, and contributes but little to world trade there. She grows such a small percentage of her foodstuffs that heavy importing is necessary, and exporting can be done only in a very small way. This leaves only manufactured goods. So we begin to realize that the only real contribution that Britain can make to world trade is by importing raw materials, adding to them the skills of management and workers, and exporting them as finished products to the markets of the world.

Only when this situation is understood can we appreciate the importance of striving to make Britain's industry more efficient. To make an industry more efficient means enabling it to produce more at lower cost. Realizing this we see the heavy responsibility that rests on those who guide or manage industry. And we see why there is so much emphasis placed on the subject of productivity. The simple fact is that greatly increased production is the paramount need of Britain today.

On April 3, 1950, Mr. Charles B. Colston, C.B.E., M.C., D.C.M., Chairman of Hoover, Limited, said, "It is only by giving real incentives so as to bring forth the maximum efforts that we shall be able to restore economic health in Britain."

In a recent speech Mr. Herbert S. Morrison said that those who want more than a minimum standard of life must contribute more than a minimum day's work, and he declared that this principle must be reflected in the industrial system of rewards.

In Wealth of Nations, Adam Smith said: "The wages of labor are the encouragement of industry, which, like every other human quality, improves in proportion to the

encouragement it receives."

Now as then, it seems that every time there is need for an added boost in production, wage incentives are one of the first things to come to mind.

CHAPTER I

INTRODUCTION

Fixing a price on human services is perhaps the most complex task that has arisen in the development of modern industry. Wages lie at the basis of industrial relations, and wage disputes are the main cause of stoppages of work. In 1949, wage disputes accounted for 42.8 percent of all stoppages in Britain.¹ During the same period, about half of the stoppages in the United States were due to monetary matters.²

Since the pay a man receives determines his share of the better things of life, it is easy to see why he is constantly seeking better wages. And why should he not sell his labor at the best price? After all, it is usually the only thing he has to sell. On the other hand, the manager cannot separate wages from output, because the amount done for a given wage determines the

¹"Industrial Disputes in 1949," Ministry of Labour Gazette, May, 1950, p. 158.

²"Work Stoppages During 1949," Monthly Labor Review, United States Department of Labor, May, 1950, p. 503.

labor cost per unit of production. It is not difficult to see why in a competitive market he opposes wage increases and constantly seeks ways and means of increasing the productivity of each employee.

Wages being considered as a compensation for productivity, if properly computed, are in most cases the greatest possible incentive to the worker. Of course, the amount of effort that employees are willing to expend depends on many factors. Beside the desire to secure livelihood for himself and his family, workers are motivated by the desire to satisfy a creative urge, or perhaps to achieve some kind of distinction for himself.

In the field of wages it is difficult to set the proper boundaries and confine the discussion within those bounds. This report on wage incentives is not by any means an examination of the whole field of problems which scientific management creates, but no dissertation on methods of remuneration would be complete without some reference to scientific management, because the manner in which the workmen are paid is one of its dominant features. Wage incentives are only a part of the whole

technique of scientific management, but they have become its best known feature. When Frederick W. Taylor read his paper, "A Price Rate System," before the American Society of Mechanical Engineers, he related that the great object in establishing scientific management was to solve the wage problem.

A wage incentive plan releases forces acting on two of the most potent factors in labor relations--wages and effort expended. Therefore, in approaching such a subject consideration must be given to scientific and engineering ability, combined with a sympathetic attitude toward the human relations involved.

"Wage incentives" in this report comprise those methods of compensating workers under which the relationship between work produced and wages earned is direct and immediate. In other words, it stresses earnings determined by measurement of output--or, as the British say, "payment by results."

The word "incentive" has taken so many meanings that today it has become meaningless. "Incentive" means inducement. When associated with wages most people naturally think of a financial inducement, and so most

incentive wage plans are conceived and designed as inducements to do more work.

The basic objective of any wage incentive should be to provide proper recognition and a legitimate and fair reward for the work done or services rendered. Incentives used only as inducement rather than fair reward are objectionable, because such a policy distorts the purpose of the plan and leads to malpractice. The inducement then tends to place emphasis upon personal and selfish gain by making the idea so tempting that the workmen will not be able to resist it.

Since the discussion is concerned primarily with a fair reward, such plans as profit sharing and co-partnership will not be stressed, because they do not typically provide for a reward in exact proportion to individual output. Bonuses predicated on company profits or other factors over which individual workers have little, if any, control are beyond the scope of this investigation. Furthermore, very little stress is put on incentives other than those which effect direct or productive workers.

The investigation is confined almost entirely to manufacturing industries. However, coal mining was considered, since it plays such an important part in industrial life. Even though passing reference will be made to other industries, most of the writer's investigation and field work were allocated to the following industries: automobile, building, coal mining, glass, paper, pottery, printing, rubber, shipbuilding, steel, and textiles. This list by no means exhausts the industries in which wage incentives are found, but time limitations necessarily restricted the scope of the study.

During the field trips no attempt was made to select a representative sample. For example, in Great Britain all the leading automobile manufacturers except Ford at Dagenham (England) were visited, and since the plain time rate system is employed there, the compiled figures would not reflect a true picture of that industry.

In most cases in Great Britain, details were given to the American Embassy, who in turn gave the writer an introduction to the Chambers of Commerce in various industrial cities. The Chambers recommended the in-

dustries which should be visited; many of them made all arrangements for the visits. Beside the more than sixty industrial concerns, many union and other helpful organizations were visited in both Great Britain and the United States.

It was comparatively easy to cover the whole of industrial Great Britain during the period of study there, but because of the vastness of the United States, the story is different. In the States, visits were restricted to the industrial Northeast, and East Tennessee. Having spent one year in the Pittsburgh, Pennsylvania, area prior to departure for Great Britain, as well as a short period after returning, it was quite convenient to reach the industrial heart of many industries without too much travel. For instance, the steel and glass industries are concentrated in Pittsburgh itself; pottery in East Liverpool, Ohio; rubber in Akron, Ohio; and automobiles in Detroit, Michigan. Much valuable information was obtained through correspondence where visits were impossible.

During the visits to industrial concerns, a trip was made around the plant, spending as much time as

possible in observing the methods used. Then an interview was arranged with the Industrial Engineer, Personnel Officer, or the person who was most familiar with the method of payment used by the concern. In some of the smaller concerns, this person was the Managing Director. The interviews took the form of questions covering every aspect of the subject of investigation. Of course, because of the differences in each individual case, interviews could not always follow a set form, and they were far from question and answer affairs. They were very informal. In the writing of the dissertation, reference is not made to a company by name, if such a request was made by the person furnishing the information.

It was impossible to gather information suitable for quantitative analysis. Even though it is generally concluded that any wage incentive has a definite effect on the productivity of the worker, the difficulty arises when we try to limit the effect to the wage incentive alone--without taking the other aspects of personnel relations into consideration. Since the behavior of workers is governed by many interacting determinants, a

given policy or practice can seldom be traced reliably to a single isolated cause or motive.

In 1940, the Committee on Work in Industry of the National Research Council concluded: "Studies of the conditions of work in industry, like studies of sick people, cannot be safely pursued to the point of diagnosis without taking account of all the kinds of factors (physiological factors, psychological factors and all sorts of social factors)."¹

Also it must be understood that a dissertation based so largely on personal evaluation of such a controversial subject reflects the writer's predilections and point of view.

The writer's experience as an Industrial Engineer with the American Bridge Company, a United States Steel subsidiary and largest steel fabricating company in the world, is naturally reflected. Many references are made to the Bridge Company not only because the writer's experience there helped him to appreciate the reality

¹"Fatigue of Workers," National Research Council, Committee on Work in Industry (Reinhard Publishing Company, 1940), p. 12.

of the problem, but more important because their methods in many of the topics discussed serve as a guidepost to the ideal situation.

Possibly the main reason for the neglect of serious study in the field of wage incentives in the past is that unemployment was a great enough incentive to cause a worker to fear the sack to the extent that he was encouraged to give of his best. It will be noticed that the discussion of incentives more closely reaches the saturation point when unemployment is lowest.

The subject started its last mushroom growth at the beginning of the last war, and even though the subject has subsided somewhat in the United States since unemployment has begun to grow, it is still one of the most exhaustively discussed subjects in British industrial circles today.

The "freezing" of wages is the cue which brings even more emphasis to the subject. In the United States, the Executive Order of April 8, 1943, stated that under wage stabilization rulings, incentive wages would be authorized. And even in Britain today it has become almost a matter of Government policy to oppose

pay rises that do not reflect or entail increased production.

But if it were not for the war periods, when many incentive plans were introduced to evade the wage freeze, the unfavorable past would have been a much stronger barrier to the adoption of such programs in industry.

It is well known that there has been a tremendous amount of research done in the United States in the field of wage incentives. In fact, it is so vast that a critical review of previous investigations is unnecessary. When the author first considered the undertaking of such a subject at a British university, there had been very little done from the British point of view, and most of this was conceived purely in terms of physical fatigue. A small total volume of research has been done, and most of this must be regarded as provisional.¹ Some good studies have been made by such organizations as the Industrial Health Research Board (earlier known as the "Health of Munitions Worker's

¹R. P. Lynton, "Incentives and Management in British Industry" (London: Routledge and Kegan Paul Ltd., 1949), p. 51.

Committee" and "The Fatigue Research Board"), the Institute of Labour Management, the Industrial Welfare Society, and the National Institution of Industrial Psychology, as well as by such well known authors as P. Sargent Florence and H. M. Vernon. After the research was begun, the subject of wage incentives has come much to the foreground in Britain. In addition to the flood of articles in magazines and newspapers, just recently two good books in the field have been released--the books of R. P. Lynton and J. J. Gracie. And Doctor N. C. Hunt of Edinburgh University has written a thesis on industrial remuneration from the British point of view.

Because of this change in the picture since the research was begun, and since the writer has been given permission to spend half of his time in Great Britain and half in the United States, it was decided to approach the subject from a comparative point of view. In every instance, a direct comparison of the various aspects presented will not be made, but comparisons are drawn whenever possible.

In writings done in the two countries, there are generally references made to the way this or that is done

in another country, but the subject has never been approached with the idea of making comparisons throughout. Thus, it is felt that such an approach is justified.

To begin with, there will be a discussion of factors to consider when comparing industrial output in the United States and Great Britain. These will include differences in amount of income tax deducted from the pay of workers, availability of goods, horsepower available to workers, and differences in traditional attitudes in the two countries. As stated before, the application of the incentive principle to wage payment gives rise to so many issues and the numerous procedures associated with incentive systems encompass so many questions of management and industrial relations, that it is extremely difficult to separate the main topic from the related questions.

There will be a brief discussion of the systems of payment that can be used. It is felt that a summary description is needed by way of introduction. Included will be (1) systems based on time, where the employer takes all the gain or loss, (2) systems based on output, where the worker takes the gain or loss, (3) systems

based on output, but where the gain or loss is shared between the employer and the employee by an agreed percentage, and (4) mere mention will be made of those systems such as profit sharing and co-partnership which cannot be included in the above. The author does not plan to go into detail in describing the various plans, nor in giving all the advantages and disadvantages, because he feels that such has been adequately discussed. However, one chapter will be devoted to an elaboration on the growth of incentive payment in Great Britain and the United States.

In this discussion, we are interested in "a fair day's work for a fair day's pay" as well as "extra pay in proportion to performance beyond a fair day's pay." Base rates should reflect fair wage differentials between jobs based on their relationship and relative requirements in terms of skill, experience, responsibility, degree of difficulty, and working conditions. Since this is so important, it is believed essential that job evaluation be discussed. Of course, the subject will not be discussed in great detail, but rather it will be approached from the point of view of the status of the

subject in the two countries at the present time.

Chapters will be devoted to the installation of incentive schemes in various types of industry, to attitudes of government, unions, employers and workpeople in the United States and Great Britain, and to the subject of restriction of output as related to wage incentive plans. These subjects are among those so closely associated with wage incentives that it was felt necessary to include them. Most of the subjects have quite a literature devoted to them, but the main points can be stated briefly.

Next will follow a comparative discussion of the use of wage incentives in selected industries. Taking the industries mentioned before, they will be examined to see how payment is made in the two countries to workers in those industries. From information gathered from interviews and correspondence, supplemented by literature and source material to better fill out the picture, an analysis of wage payment will be made, with emphasis on the portion of workers paid by incentive methods.

In so far as possible, every attempt has been made to keep political feelings from the writing. Occasional mention will be made to such subjects as nationalization, but the author's attitude will not be expressed, because he feels deeply that a person accustomed to and completely sympathetic with one form of government will naturally disagree with certain aspects of governments of other countries; and further he appreciates the fact that the peoples of every country have the right to their own customs and convictions. During visits to nationalized industries, as well as those where nationalization is threatened, high officials went into detail expressing freely their feelings toward the act, but such prejudiced expressions only helped to confuse the author in his already established attitude.

Mention should be made of differences in spelling and grammatical rulings in Great Britain and the United States. American rules are followed throughout the thesis, and American spellings will be used except in cases of direct quotations, or when reference is made to British industries, organizations, or publications where different spellings are involved.

Acknowledgments of thanks are due to many industrial plants, organizations, and individuals both in Great Britain and the United States. Appreciation, firstly, must be conveyed to superiors and colleagues at the American Bridge Company for their bearing during "the green years," and helping the writer to gain experience for a firm foundation in the installation and workings of an incentive scheme before the research was begun.

Chambers of Commerce in both countries deserve the warmest praise for making visits to their cities experiences of happy remembrance. This is particularly true of the Coventry (England) Chamber. Too, the Institution of Works Managers must be mentioned. Through its chairman, Mr. A. P. Young, O. B. E., an extremely pleasant and informative period was spent with various industrial concerns in the Glasgow (Scotland) area. To Mr. E. D. Galloway, Honorable Secretary of the Glasgow Branch of the Institution of Works Managers, the author is grateful for his untiring efforts to make the visit such a profitable experience.

The North British Rubber Company at Castle Mills, Edinburgh, permitted the writer to spend four weeks at Christmastime, 1949, with its Industrial Engineering Department. This period was especially interesting since the company was in the process of changing one of its larger departments to mass production methods, and employing a new wage incentive scheme there. For this period during which it was possible to get a better idea of the British attitude, the author is grateful to the management and workers for giving so freely of their time and experience.

It would be impossible to mention and give acknowledgments of thanks to all the firms, organizations and individuals for the readiness and courtesy with which they have taken time from their immediate and practical concerns with industry to answer the questions of one interested in such things. And--as far as Britain is concerned--commendation is due for their remarkable cooperation with an outsider and an American.

CHAPTER II

SOME FACTORS TO CONSIDER WHEN COMPARING INDUSTRIAL OUTPUT IN GREAT BRITAIN AND THE UNITED STATES

It would be incorrect to attempt a comparative study of any aspect of industrial output in two countries without first pointing out some of the differences which appear on the industrial horizon. Two groups of people living under such different industrial and social conditions as exist in Great Britain and the United States today are naturally not expected to look toward their working day with the same attitudes. There is no single factor which will explain the differences in productivity in two countries. The home life is different, recreation is different, conditions in the industrial establishments are different, and the economic conditions of the country as a whole are different.

It is possible to point out a few of the general factors, but in an ultimate analysis only a detailed study of individual industries concerned would reveal

all the specific factors which account for such differences. For example, the high output per man in the United States coal mines is due to the favorable natural conditions which find no parallel elsewhere in the world.¹

Income Tax. Governments should adopt an income tax program that will capitalize the energies and ambitions of the people, stimulate their initiative and imagination, and reward their energy and thrift. Tax policy is certainly a major factor in determining the degree of national prosperity. The essential thing should be to provide the people with incentive to work harder with a reasonable hope that they can retain for themselves an appropriate share of the wealth they have earned or created.

A discussion of income tax in the two countries is difficult at the present time. Because of the international situation, tax rate changes are under consideration, but it will be understood that the conditions discussed are those in effect at the beginning of the

¹L. Rostas, Comparative Productivity in British and American Industry (Cambridge University Press, 1948), p. 50.

present fiscal year.

The standard income tax in Great Britain is nine shillings in the pound, or 45 percent. A single man pays this rate on all his income over 450 pounds a year, and a family of four pays it on income over 687 pounds. No less than 43 percent of all the money earned in Great Britain passes through Treasury hands. According to a writer for the Economic Co-operation Act, "taxation, not Socialism, is the number one issue in Britain."¹

Everybody, not just the well-to-do, is and feels overtaxed. The ECA has calculated that the taxes paid by those earning less than ten pounds a week (80 percent of the population) amount to a little over 67 shillings per family per week. A good example of the killing effect which taxes have on incentive payment is brought out in the recent case of the profit-sharing bonus at the Vauxhall Motor Company. The bonus worked out at over eight pounds for each worker, but the average amount received after tax was only five pounds.

¹John K. Jessup, "Britain's Road Back," Fortune, May, 1950, p. 80.

In Great Britain the question of income tax was usually the first mentioned in a discussion of wage incentives. The attitude expressed by many employers was that the impact of the income tax system, as Mr. J. J. Gracie states it, "hits the operator just at the point where you are asking him to take his coat off and do a bit more and go all out. It is exactly at that point that the wage curve 'flattens out' and he has to start paying nine shillings in the pound."¹

This factor of taxation is not applicable only to the incentive of the worker, but it also impairs industrial progress. Industry has the greatest difficulty in setting aside reserves to cover renewals of machinery and deferred repairs. Such conditions cause a general unwillingness to risk capital in any new enterprise when the rewards are so inadequate, and when a multiplicity of controls and restrictions bog down and frustrate productive effort. Geoffrey Crowther, editor of the Economist, states that "It is true that a smaller proportion of profits of industry has, for a generation

¹J. J. Gracie, "A Fair Day's Pay" (London: Management Publication Trust Limited, 1949), p. 9.

past, been plowed back in Britain than in America, but it is not true to say the businessman has 'pocketed the great bulk of the profits.' The tax collector has pocketed them."¹

Too, some of the industries are threatened with nationalization. And, whether they like it or not, the majority have to do much of their business the harder way--in the export market. "Compared with their American counterparts their lot is, indeed, a hard one."²

In late July, 1950, Prime Minister Attlee announced the appointment of a Royal Commission to inquire into ". . . the whole of the present system of taxation of profits and income, with particular reference to the taxation of business profits and the taxation of salaries and wages."

In the United States, the rate of income tax does not reach a comparative exorbitant figure until it is

¹"Fortune's Wheel," letter from Geoffrey Crowther, Fortune, May, 1949, p. 52.

²"Call for Courage," The Machinist, August 27, 1949, p. 55.

completely out of the range of the working class. In fact, the increase in rate from the lowest income group to the group which embraces the wages of the middle income group is only two percent.¹ The increase in rate is gradual rather than increasing at tremendous rates at certain points as in the British system. In the United States, the standard rate is 15 percent as compared to the British 45 percent. And instead of 43 percent of the national income going through Treasury hands, the figure in the United States is about 17 percent, based on the estimates at the beginning of the current fiscal year. Drawing actual comparisons from the United States and Great Britain is extremely difficult because the selection of comparative incomes in the two countries cannot be made on an accurate basis. Income tax deduction scales are shown as Appendix A.

Availability of consumer goods. It can rightly be argued that the working man looks to his pay packet as the key by which he unlocks the cupboard containing

¹Murray W. Duberstein, editor, Prentice-Hall Federal Tax Course, 1948-1949 (New York: Prentice-Hall, Inc., 1949), p. 1107.

the satisfaction of his desires. But if the key unlocks the door and does not give access to a cupboard loaded with good things, the frustration can become more important to the worker than does the pay packet. An increased pay packet, to be effective, must give the assurance of a fuller life. Everywhere in Britain today there are restrictions, controls, permits, licenses. The shops lack many of the everyday things the people need; and to a working man, wages have no meaning except in terms of purchasing power.¹

The average working man seems to visualize in his mind what wages will buy, and in many cases his standard of living is determined by the available supply of goods and services. After such standard is set, he will want more wages only if more goods and service are available. Rationing and high prices restrict purchases, and the incentive of harder work for more pay is very weak. Further, if the worker is not anxious to change his standard of living, an increase of rates of pay will

¹Reginald Pugh, "This Talk of Incentives," Industry, November, 1949, p. 24 (an impression of the 50th Oxford Management Conference which was concerned with incentive--the will to work).

merely result in fewer hours being worked, and an increase of rates per piece in fewer pieces being made.¹

It has been said that there is a world of difference between the statements "He who does not work shall not eat" and "He who does not work shall not have a radio or a refrigerator."² However, in America today the ready availability of goods that help to make life more full, creates a definite incentive to the worker to work harder and earn more money.

It would be unfair to make a comparison of costs of various items in Great Britain and the United States by simply converting sterling values to dollar values, or vice versa; therefore the National Industrial Conference Board has made a comparison of costs in the two countries based on how long a man has to work to buy what he needs. This study is shown as Figure 1. Actually, practically all American goods quoted in the survey are dearer than similar British goods, but the wide difference in wage rates between the two countries

¹p. S. Florence, Labour (London: Hutchinson's University Library, n.d.), p. 99.

²Nigel Balchin, "Satisfaction in Work," Occupational Psychology, July, 1947, p. 128.

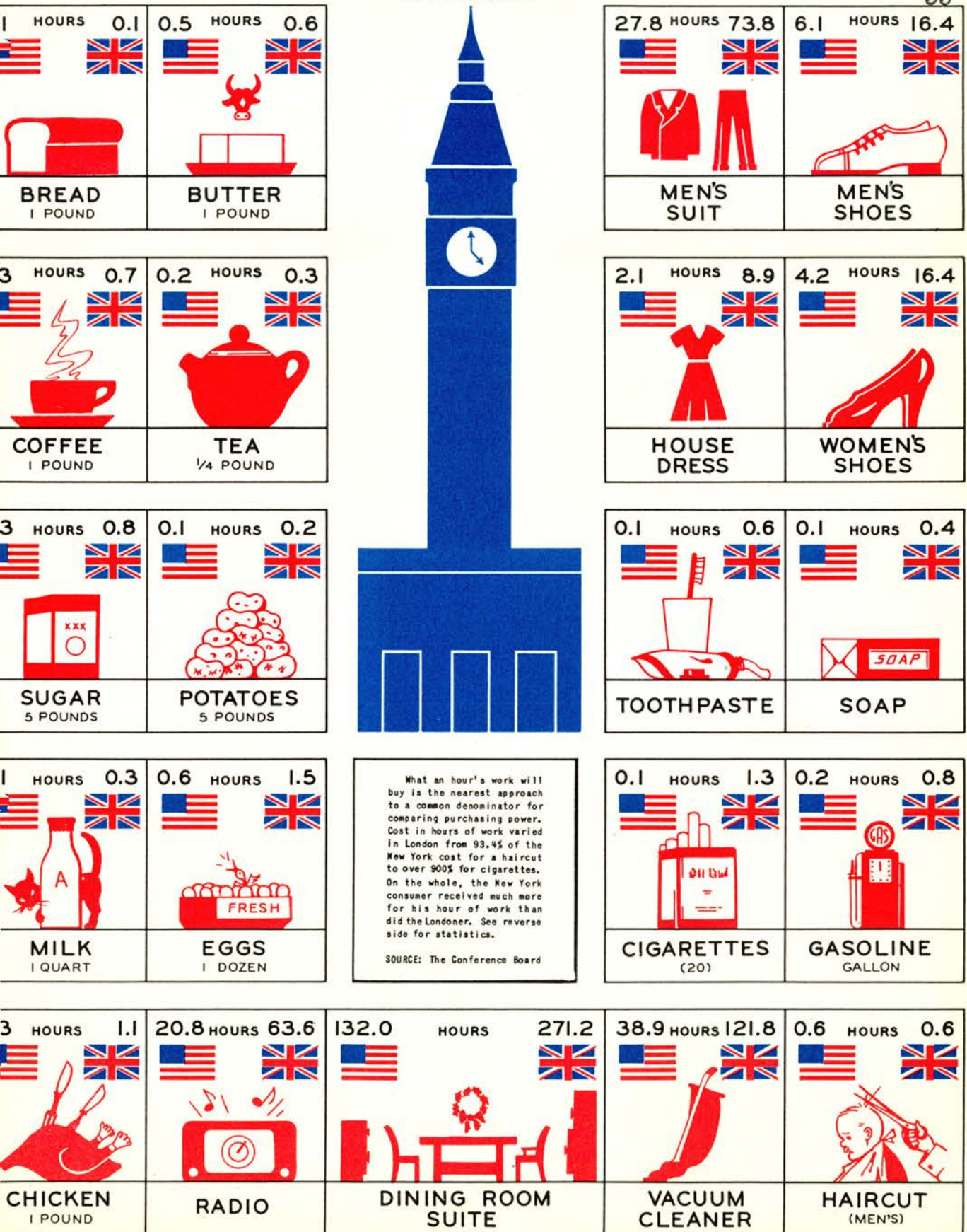
Figure 1

CONSUMERS' PRICES, NEW YORK - LONDON

COST OF ITEMS IN HOURS OF WORK

SEPTEMBER, 1949

33



CONSUMERS' PRICES, NEW YORK - LONDON

Cost Of Items In Hours Of Work

Source: The Conference Board

Item	Hours of Work(1)		London Cost in Hours as
	New York	London	% of New York Cost in Hours
<u>Food</u>			
Bread, white, 1 lb.	.11	.11	100.0
Potatoes, white, 5 lbs.	.14	.24	171.4
Cabbage, new, 1 lb.	.04	.19	475.0
Tomatoes, ripe, 1 lb.	.13	.14	107.7
Peas, canned, 20 oz.	.17	.51	300.0
Oranges, juice type, 1 lb.	.07	.32	457.1
Apples, 1 lb.	.05	.38	760.0
Bananas, 1 lb.	.10	.38	380.0
Orange juice, canned, 46 fl. oz.	.31	1.95	629.0
Tomato juice, canned, 46 fl. oz.	.14	1.24	885.7
Soup, canned, 10½ oz.	.08	.22	275.0
Flour, 5 lbs.	.25	.57	228.0
Sugar, 5 lbs.	.31	.78	251.6
Tea, ¼ lb.	.17	.30	176.5
Coffee, 1 lb.	.33	.70	212.1
Milk, 1 qt.	.14	.32	228.6
Butter, 1 lb.	.50	.62	124.0
Cheese, American, 1 lb.	.33	.43	130.3
Milk, condensed, sweetened, 10 oz.	.06	.16	266.7
Eggs, grade A, 1 doz.	.57	1.51	264.9
Peaches, 1 lb.	.07	.30	428.6
Bacon, 1 lb.	.47	.76	161.7
Beef, chuck, 1 lb.	.37	.38	102.7
Beef, sirloin, 1 lb.	.65	.76	116.9
Chicken, 1 lb.	.31	1.11	358.1
Herring, canned, 1 lb.	.32	.49	153.1
Oatmeal, rolled oats, 1 lb.	.20	.24	120.0
Ice cream, 1 qt.	.58	2.27	391.4
<u>Clothing</u>			
Raincoat, cotton gabardine	11.78	45.78	388.6
Suit, blue serge	27.76	73.78	265.8
Shoes, men's	6.12	16.43	268.5
Shirt, men's	2.07	6.41	309.7
Overalls	3.05	8.30	272.1
Hose, men's	.58	2.24	386.2
Hat, men's	3.47	14.19	408.9
Dress, rayon	7.15	14.19	198.5
Dress, house	2.08	8.89	427.4
Hose, women's nylon	1.04	4.19	402.9
Hose, women's rayon	.94	2.46	261.7
Shoes, women's	4.16	16.43	395.0
<u>Housefurnishings</u>			
Mattress	20.81	96.73	464.8
Rug	55.55	156.27	281.3
Sheet	1.55	6.57	423.9
Linoleum	2.36	4.97	210.6
Dining Room Suite	132.02	271.16	205.4
Blanket	8.69	14.54	167.3
Iron	5.52	13.24	239.9
Vacuum Cleaner	38.94	121.81	312.8
Refrigerator	134.63	672.76	499.7
Radio	20.81	63.57	305.5
<u>Miscellaneous</u>			
Tooth Paste	.14	.57	407.1
Shaving Cream	.31	.97	312.9
Haircut, men's	.61	.57	93.4
Newspaper	.03	.03	100.0
Movies	.50	1.05	210.0
Cigarettes, 20	.14	1.32	942.9
Soap	.10	.43	430.0
Gasoline, gal.	.18	.78	433.3

Note: In mid-September, 1949 The Conference Board sent a research team to London, England, to collect prices of typical consumers' goods. To eliminate confusion as to exchange rates and differences in wage levels, prices were converted to hours of work necessary for the purchase of these items by dividing their prices by the average hourly earnings for each country.

Caution: The figures shown here must be used with caution, since in some cases it was impossible to get prices for exactly comparable articles in both countries; e.g. only a three-cubic-foot-capacity refrigerator is available in Great Britain for home consumption, as compared to the six-cubic-foot-capacity model priced in the United States.

(1) Average hourly earnings for each country include all important industries except coal mining, railroad transportation, and wholesale and retail trade. Earnings of government employees are included for Great Britain, but not for the United States. Weighted average hourly earnings for the United States are taken from United States Bureau of Labor Statistics release, "Employment, Payrolls, Hours, and Earnings," 1949, revised series, for April, 1949 = \$1.488. Weighted average hourly earnings for Great Britain are from Ministry of Labour Gazette, September 1949, for April, 1949 = 31.6d.

results in the costs favoring the American worker.

A recent British visitor to the United States expressed his fascination to the writer at seeing so many of the working class driving new automobiles. The urge for such items as automobiles has long furnished the American with an incentive to work harder. Since the early days of Henry Ford's venture into automobile manufacturing, the theory has been expounded that if we are to have a prosperous economy, the industrialist must pay wages "high enough to enable his workers to buy the things they produce." Ford's idea was a car for every working man, and in order to make the idea a reality, he brought the price of cars down and sent the wages of workers up.

Prewar Britain assumed that automobiles were and would remain a luxury, available only to those with large incomes. Today heavy purchase tax must be paid and a sizable annual tax is levied on anyone who owns an automobile. Too, gasoline is highly taxed.

Last year the United States, with only three times as many people, made and sold ten times as many automobiles as did the United Kingdom. This is just one of

the many items which makes a difference in attitude of the American worker to increase his earning capacity in order that he, too, might better enjoy life.

Size of market. It is frequently argued that the United States owes her higher efficiency to her big market, which enables specialization and the use of specialized machinery. The home market in the United States is several times as large as that in the United Kingdom, but the American manufacturer has to satisfy a wider range of needs arising from a wide variety of climatic and territorial conditions. Too, it must be emphasized that Great Britain's market is not Great Britain alone. Her market is the world. At the present time about six percent of American production is exported. In the United Kingdom the proportion may be as high as 75 percent for some articles, but the average is roughly 20 percent of all products.¹ When satisfying world markets, however, it must be remembered that there is of necessity a wider variety in products. The exported goods must be of a type which the overseas buyer

¹"Simplification in Industry," Anglo-American Council on Productivity, October, 1949, p. 9.

requires, but at the same time the price must be such that he is willing to pay.

A recent study¹ proved that there is some relationship between the size of the market and productivity, in the sense that the greatest relative advantage in productivity in the United States is shown in industries where the American market is relatively very large. This is true in such industries as rubber tires, tin cans, motor cars, radios, and matches. However, in making comparisons between Great Britain and the United States, the size of the relative British market fails to hold to the criterion. With such products as soap or biscuits, for example, United States productivity is relatively high, though the size of the industry is not appreciably greater than in Britain. Also it was found that in some industries such as breweries and wool, even though the size of the industry is the same or smaller than in Britain, there is an advance in American productivity.

Mechanical help available. Perhaps the most immediate factor effecting output per worker is the amount

¹Rostas, op. cit., p. 59.

of machinery available. Horsepower per worker is an indicator of the quantity of machinery at the elbow of the worker. In the United States the power applied per worker has now been increased to 7.25 horsepower, an equivalent to the muscle power of fifty-eight men at the disposal of the average worker.¹ In Great Britain the equivalent is estimated at three horsepower.²

Frederick W. Taylor once said that with British workers it is almost a religion to turn out as little work as possible.³ During visits to industrial plants in Britain, the writer on numerous occasions was asked to make a comparative appraisal of the personal effort put forth by the worker at his task. Enough time was spent in some plants (five weeks at one) to get a good idea of worker effort, and the conclusion was in most

¹"Horsepower Per Worker Now 7.25," Factory Management and Maintenance, July, 1949, p. 246.

²A. P. Young, O.B.E., "American Management Techniques and Practices and Their Bearing on Productivity in British Industry" (London: Institution of Works Managers, 1949), p. 57.

³H. M. Vernon, Industrial Fatigue and Efficiency (London: George Routledge and Sons, 1921), p. 119.

cases just opposite to Mr. Taylor's statement. Taking such factors as working conditions and mechanical help into consideration, the enthusiasm shown by the British worker is just as great as that of his American counterpart.

British industrialists are still experiencing some difficulty in obtaining mechanical replacements. The 1950 Annual Report of Vauxhall Motors, Limited, stated that "70 percent of our present machines are from ten to twenty years old, mainly because of difficulty experienced during the war and since in obtaining replacements."

Labor problems. Whereas the Americans say that the purpose of industry is to produce better things more cheaply, a Britisher will say that its purpose is to assure a secure livelihood to as many people as possible.

The policy of full-employment which is in effect in Britain today is obviously beneficial to the community as a whole, but it has deprived the manager of effective disciplinary action. If an operator is dismissed for low productivity he is not likely replaced by a better man. The Economic Survey for 1950, states that throughout 1950, as in 1949, over Great Britain as a whole,

there will be as many jobs as people wanting them.

In America today there is a compulsion of fear among the workers. They can be downgraded if they fall below the high standard constantly demanded of them, and if they are slack, they can be fired. Most American industries have a labor surplus, and the workers seem to feel that surplus breathing down their necks.

Craftsmanship. The traditional emphasis in Britain is on quality and craftsmanship, against the American aim of high output. There is a certain amount of feeling that the introduction of American mass-production techniques might result in quantity at the expense of quality. American workers seem unperturbed by methods which in Britain seem damaging to the status and dignity of craftsmanship. One of the major problems to be solved in Britain today is to find a substitute for the pride in the job which is the distinguishing mark of the true craftsman. A recently issued British pamphlet¹ states that "In the days of

¹"Organizing for Output" (London: British Institute of Management, 1950).

craft work, when the manual worker was able to do a job from start to finish, and to see it grow under his hand, there was real satisfaction in the mere creative act, the same sort of satisfaction as an artist feels in painting a picture. But today, when few workers do more than one small part of any job, and often no more than one operation on that one part, this creative satisfaction is less often achieved."

The writer had an opportunity to see craftsmanship being replaced by mass production methods in one British industrial concern. The true craftsman refused to agree that a mass produced product could equal the article he made by hand. One writer expressed that in America "you have to employ methods which a crowd can carry out, but the British individualist will not have that."¹

Anglo-American Council on Productivity. One interesting approach to a comparative study of reasons for differences in worker productivity in the United

¹W. F. Watson, The Worker and Wage Incentives (London: Hogarth Press, 1934), p. 12.

States and Great Britain is by a review of the reports made by the Anglo-American Council on Productivity. The Council was established in October, 1948, on the initiative of Sir Stafford Cripps, Chancellor of the Exchequer, and Mr. Paul G. Hoffman, Economic Co-operation Administrator of the United States. It consists of representatives of management and labor in each of the two countries, the British section being nominated by the Federation of British Industries, the British Employer's Confederation and the Trades Union Congress.

The purpose of the Council is to interchange ideas in various industries through studies made by teams composed of employers, managers, technicians, and operatives who make an appraisal of their business counterparts in the other country. It should be understood that the scheme was originally established on a two-way basis, and not strictly for the purpose of sending British teams to the United States. After all, it would be very wrong to give the impression that all American industry is efficient. An example of Britons teaching Americans resulted from the productivity team sent to the United States to study the chemical fertilizer industry. One member of the team stated that

what he saw in American factories reminded him of the state of British production twenty years ago. The general verdict of the British team was that the Americans have a lot to learn. American producers agree, and plans were made for the dispatch of an American team to the United Kingdom to acquire the British "know-how." At the moment twenty-four British teams have visited the United States to make a study of American "know-how" in their particular field.

When the Council was first suggested in Parliament, the idea received praise from some sources, but there was much opposition. Anthony Eden said that ". . . the British industry position has always been on quality rather than quantity. . . . what I do not think the House should be asked to accept is that our industry is in a position where we require advice from any country, however imminent, in the conduct of our industrial enterprises." Other sources stressed the fact that the Council should not hold a post-mortem on British productivity, but that the objective should be to make practical suggestions for increased production.

The productivity teams in many cases came to the same conclusions regarding some aspects of the working forces of the two countries. The reports have been almost repetitive in their appraisal of American industrial achievements. In seeking the secret of American industrial superiority, the reports point out such things as the ample supply of power to the worker, the mechanical aids he has to assist him, the pride the worker takes in new machinery, and the ease and speed with which he adapts himself to new arrangements on the shop floor. However, the two things that receive most emphasis are the worker's attitude toward his work and the high standard of living. The first report of the Council was that of the Steel Founders Productivity Team, submitted August 5, 1949. The members of the team noted with some disliking the intense competitiveness of workers, the ruthless struggle for promotion, the restricted scope of craftsmanship, and the fear of dismissal which drives the American worker on. They noticed the lack of a fear of producing too much, a central obstacle in British production today. In Britain the deep mark left by the pre-war slumps on the

national life has caused the maintenance of full-employment to become a sacred doctrine which all parties support and hardly anyone dares to challenge.

At all levels, the steel founders report states, monetary incentives are in evidence, and they are effective because rewards for extra effort are not whittled away by severe taxation. The team was impressed by the convenient layout of American foundries and the practice of using machines as much as possible to eliminate manual labor. The members had no doubt as to the superiority in American management, but the main lessons seemed to be psychological. They state that there is no distrust of technical progress among American workers. "The readiness of the American worker to accept new machines, new methods, and the use of new materials was most evident." In Britain, workers are haunted by the fear of unemployment and are suspicious of new methods for speeding up production. They still look upon the machine as a rival or enemy, and not as an ally that can perform heavy tasks, quicken industrial processes, bring down costs, and thus stimulate

demand.¹

The specialist team on mechanical aids reported that it had been particularly impressed with the wide application of materials handling equipment, and with the general appreciation by managements and workmen of the relationship of productivity to their standard of living. In no case did the team find opposition to the introduction of mechanized aids.

The team sent from the building industry states that the American builder is induced by the incentive of a high standard of living, and the goad provided by the fear of losing that standard. The American building craftsman's wages are among the highest paid in industry, but the worker runs the risk of joining the pool of unemployed on low relief payment if he does not reach the required standards. In Britain no unemployment is foreseen in the building industry, and the least efficient builder is able, as things exist, to secure a comfortable living.

¹"Production in the United States," The Scotsman, September 29, 1949, p. 4.

The American works steadily at a higher speed for two reasons, states the team from the British electrical industry. Firstly, he can buy more goods with his wages than can his British counterpart, and, secondly, he has a more varied and fuller diet. The team also found that the Americans employ more mechanical aids and more modern machinery than the British, but that in many cases the craftsmanship of the British worker was superior to the American.

One of the first comments made by the team which studied clothing manufacturing in the United States was that the American workers seem to work steadily at a higher speed than his British equal. The team was also impressed by the fact that once piece rates had been established they were maintained and could not be changed without union agreement. If the worker turns out more than is expected under the established piece rates, he receives the full reward and the rate is not cut.

Teams from the cotton mills of Great Britain have painted a picture of British inferiority similar to that of the Platt mission six years ago. The cotton industry in the United States is not divided into the three distinct divisions of spinning, weaving and doubling, as

is the case in Lancashire (England). The three processes are normally carried out in the same mill in the United States, and to all intents and purposes comprise only one industry. This fact was evidently not known when the three separate teams were sent to America.

The group from the spinning mills included tables of comparative productivity in its report. Differences in the two countries are shown by giving the number of workers required to produce a given output. For example, for every one hundred operatives required to produce one hundred pounds of product in an average American cardroom, 263 are required in an average British cardroom.

Both the Platt and the Anglo-American teams denied that British skill is inferior to American. One of the first reasons given for the differences is that American spinners have the pick of the cotton crop. Processing and work control are simplified for the American spinner, because he is assured of a continuous supply of the same grade, staple and character. This report again brings out the "productive-mindedness" of the American worker. "Managements are very receptive to new ideas and will

try out any new device themselves rather than depend on others to try it out. They will do so as an insurance against being left behind in the race, and they do not mind having occasional failures. Operatives are prepared to give new devices and set-ups a fair trial with a fair work assignment and are encouraged to do so by the unions."

The cotton yarn doubling team found that the American methods of making a scientific work-load assessment and basing upon it a system of payment relating reward to effort are very sound, and offer a pattern worth following in Britain.

The team sent to the United States to study simplification in industry was greatly impressed by the enthusiasm for high productivity and low cost displayed at every level in American industry. The layouts were excellent and every detail of the process was thoroughly studied to secure maximum output of the plant and labor force with minimum human effort. Excellent production control was noticed. Simplification was sought at every level, and the team was convinced that specialization had been carried much further in the United States than

in its own country. The members found a greater readiness in America for manufacturers to share their technical knowledge and to discuss production methods with competitors than is general in the United Kingdom. "We believe," states the team, "that the extremely competitive and cost-conscious climate of American industry with this readiness to share knowledge, makes a major contribution to high productivity."

The first comment thought necessary by the rayon weaving team is that of the overwhelming preponderance of automatic looms in the United States rayon weaving industry. The team estimated that 98 percent of the looms seen during the tour were automatic.

A repeated stress was put on the size of the American market and the intensive advertising education used to train the people to require more or less the same sort of things. "The manufacturer in the United States is in the happy position of being able to keep his automatic looms running on a restricted number of qualities whereas the British manufacturer, with his eye on the various export markets which he has to satisfy with widely differing qualities, has to produce

in relatively short runs the particular type of fabric demanded by each of his many customers." As with many of the other productivity reports, this rayon weaving team put emphasis on the use of the cash incentive and its fuller appreciation in the United States. It states that ". . . it is of course very much easier to provide a tangible incentive worth working for than it is in the United Kingdom at present. This is an important factor in the differing productivity of the two industries."

A team of British trade union officials visited the United States at the end of last year to make a study of the role of American unions. According to the report it is "to find ways and means of increasing productivity--a problem concerned mainly with industrial policy and action as distinct from the political pressure to achieve full employment and economic stability."¹ It must be realized that there is a big difference in unionism in the two countries. Industry-wide contracts are rare in the United States, and the contract between

¹"Trade Unions and Productivity," Trades Union Congress, 1950.

a union and a single company is common. There is closer contact between American union locals and the individual plants they serve. Plants often pay union representatives to handle union business on the spot; there are 263 representatives of the United Automobile Workers attached to the sixteen branches of the Ford plants, paid by the Ford company to watch the interests of 11,000 union members.¹

The flow of teams to the United States continues. Many of the conclusions reached are repeated by team after team. Some of the factors and basic ideas are sound, but there are so many of them that will not work in Great Britain that one begins to conclude that America has industries more efficient than Britain mainly because Americans are different from Britons. The teams agree that American industrial superiority is not due solely to America's vast material advantages or to any technical secrets. It is credited to the general outlook and spirit of American industry. The reports say

¹"Productivity and Labour," The Economist, July 29, 1950, p. 228.



that nothing matters beside a steadily mounting output from every man hour.

The American worker does not worry about methods which in Britain seem damaging to the status and dignity of the craftsman. The impulses of assurance of a generous reward and "the compulsion of fear" drive the worker to greatest effort. The difference in attitude is easy to see. Since the war Britain has been incapable of reproducing either the rewards or the punishments of American industry. But the matter goes deeper than this, one reporter relates. Britain is hindered by history as the Americans are not. "When the British working-class was soaking in the bitterness of the Anti-Combination Laws and struggling to build up a purely protective trade unionism, the Americans were fighting Redskins. . . . We cannot duplicate here the adventurous, youthful, pioneering climate of American industry. But there is much we could learn both about production technique and about the science and art of management. We should not need to copy exactly any American model. A pattern can surely be devised which would be essentially British in character, but far more efficient than the one

we have now."¹

As far as methods of payment are concerned, British industrialists are especially hesitant to copy any system of payment which savors American methods, because the average British worker possesses a natural antipathy toward ideas that come "from the other side of the Atlantic, the supposed home of the heartily despised and detested efficiency experts."²

¹C. F. Dunn, "Americans at Work," The Observer, July 9, 1950, p. 4.

²"A Critical Examination of Methods of Industrial Remuneration With Special Reference to the Requirements of British Industry," unpublished doctorate thesis of Norman C. Hunt, University of Edinburgh, 1948, p. 319.

CHAPTER III

METHODS OF PAYMENT WHICH CAN BE USED

As a means of introduction to the field of wage incentives, a summary description of the systems of wage payment available to management will be discussed. So many books and portions of books have been devoted to such discussion that it will in this case be done in a cursory manner.

In remunerating his workmen an employee^r is faced with the problem of choosing from a great many systems of wage payment. He must first decide between the two fundamental bases to which all the different plans can be reduced, namely time wages and piece wages. All the modern plans of wage payment are variations or combinations of these elemental types. In the discussion the "task" refers to the amount of work per hour which management assigns to be done. It is the time allowed for each unit of output.

If a worker is paid by time, according to the number of hours he works, there is an incentive to go to the job, but once he is at the workplace, it makes

little difference to him whether he produces more or less.

Taking the whole of working incomes, time rates are the most common types of wages. Being merely a rate per period of time multiplied by the number of periods, they are the only type of payment which can be used when the output of the individual is difficult or impossible to measure with any degree of accuracy.

The question of which jobs can be accurately measured for payment by results is widely argued. A British author¹ recently made a rough estimate of the proportion as 70 to 75 percent suitable for payment by results and 25 to 30 percent suitable only for plain time rates.

Under the time rates the employee guesses at the amount of work which the employer expects. He arrives at an arbitrary amount of production below which he will be discharged, and his tendency usually is to standardize his performance as closely to the minimum as possible.

¹C. L. Guest, The Technique of Industrial Labour Payment (London: Macdonald and Evans, 1948), p. 89.

If any industrialist would analyze his workers with the view of determining the amount of work they actually do, as opposed to what they could do, he would surely conclude that payment other than time rates is justified if the workman can be induced to give of his best.

Measured Day Work came into prominence during the depression in the thirties. It is a compromise between a regular incentive plan and a no-incentive time plan, and is essentially a combination of job evaluation and merit rating. Such plans are very effective for the fixed type of production. The basic hourly rates of the workers are graded by job classification. A time range is determined for the job, and the amount of pay depends on whether the worker produces his "measured" amount of work, combined with other normal rating factors.

Customarily, where measured day work is used, new workers are re-rated every month, and others four times per year. One of the major criticisms is that so many intangible personal virtues are used in determining the final pay of the worker. These include such factors as (1) quantity of production, (2) quality of production, (3) versatility, (4) dependability and others. As an

incentive method it is questioned because of the indefinite relationship between performance and reward. There seems to be a tendency for all workers to get the top bonus for their range.

Piece Rate earnings represent, in their simplest form, a payment of so much per unit processed. Such rates are suitable only where there is a direct relationship between output and the skill and effort required of the worker, and where the work is uniform, continuous, and independent at each person's operation. Wages of some workers on piece rates depend entirely on output, but many receive specified guaranteed base rates.

Variations of straight piecework have been introduced as a method of enhancing the incentive effect. The Taylor Differential Piece Rate Plan established two different piece rates. One rate applies to production below the standard task and the other applies where the worker's production is equal to or in excess of the standard task.

A variation of the Taylor plan is the Merrick Multiple Piece Rate Plan. Instead of the two different

rates used in the Taylor plan, the Merrick plan establishes three. One rate is for sub-standard work, usually applicable to beginning workers. The second rate is also a sub-standard rate, but is just a little below the standard set for the job. The third rate is above standard piece rate.

Several of Taylor's followers in the United States introduced other variations of his plan. H. L. Gantt was one of these. The Gantt Task and Bonus Plan involves a distinction of workers who make standard and those who do not. For the latter, straight time wages prevail. For those who make standard, payment includes full compensation at piece rates plus a 20 percent on such piece rates.

The Emerson Efficiency Plan is a further development of the Taylor plan. This plan presupposes scientifically planned organization, careful time and motion studies, accurate determination of wage rates, and all other aspects of expert instruction and supervision. For each job a time is determined and if a worker is able to complete the job in that length of time he is considered 100 percent efficient. A table of bonuses

is determined, indicating the incentive pay granted to employees for varying degrees of efficiency. Work below 66 percent is sub-normal; 66 percent is the basis. A small bonus is paid on 67 percent and upwards to 90 percent, where it reaches 10 percent. For every additional one percent after 90 percent, one percent bonus is added, so that when efficiency reaches 100 percent the bonus is 20 percent.

There are many variations and modifications of the Emerson plan. The Parkhurst Differential Bonus System sets up 15 or more bonus classes, granting incentive awards to employees when efficiency reaches 60 or 70 percent of the standard. The Bigelow Plan operates in a similar fashion, except that the bonus starts at 73 percent.

The Knoeppel Efficiency Bonus Plan guarantees wages up to 67 percent of task and provides bonus for efficiency between 67 and 100 percent. The efficiency points of the bonus are slightly higher than the Emerson up to 85 percent, but are practically the same from 90 to 100 percent. The total bonus for 100 percent efficiency is 25 percent instead of the 20 percent under

the Emerson plan.

Other modifications of the Emerson plan include the Bigelow-Knoeppel Efficiency Bonus Plan, the Ernst and Ernst Plan, the Wennerlund Efficiency Bonus Plan, the Ficker Differential Bonus Plan, and some other less significant plans such as the two English modifications--the Allingham and Atkinson Plans.

An important group of wage systems bases its remuneration primarily upon the measure of time saved and compensates the worker directly with such savings. A given time is allocated to a piece of work and a percentage of time saved is paid to the worker according to the system used. The Halsey Plan is the oldest premium bonus type of wage payment systems. It sets a task time for each job and this becomes the basis of computation of pay. Reward is given the employee in form of a premium or incentive bonus, equal to some proportion between 30 and 70 percent of the value of the time saved in his performance of his assigned task, with the basis of computation, as indicated, being the task time established for each job. Under the Halsey plan an hourly rate is established for each operation in

order that the worker is assured a regular day wage even if he does not reach the standard set for the assigned task. Messrs. G. and J. Weir of Glasgow use a form of the Halsey system. There it is known as the Halsey-Weir, or in many cases merely as the Weir.

The Barth Premium Plan follows the Halsey principle, except that the rate used for computing the incentive bonus paid the employee for time saved is different.

Another plan which follows the Halsey theory is the Rowan Premium Plan. After the task is established and an hourly rate is set, the employee is paid the specified hourly wage for each hour of work, and the incentive bonus paid is determined by computing the proportion of time saved by the employee against the task time allotted for the job--on the basis of actual time he spent in completing his task. As an example, the worker receives a 25 percent increase in his earnings if the time saved is 25 percent, computed on the basis of the actual time he has taken in the performance of his job.

Two other plans which embrace the Halsey plan are the Baum Differential Premium Plan and the Diemer

Premium Plan. However, both of these plans also have Taylor principles involved in their set up. For instance, the Diemer plan works on the following basis. When it was originally installed by the sponsor of the system, workers were paid a 10 percent increase in wages if they reduced the time of the job below past average. They were paid 20 percent bonus if the work was done in a specified standard time. A further "gain sharing bonus" was awarded if they did the work in less than the standard time. Too, a record was kept of every man's percentage of success during each pay period, and this was used as a basis of promotion in his hourly rate.

The Bedaux System represents one of the newer types of incentive payment. Instead of task times and production units, the point system unit is devised to represent the expenditure of energy to be expected from a worker in a certain time, and to account for the amount of rest an average worker needs during its performance. Consideration is given to the fact that from purely physical reasons there must be intervals of rest according to the needs of the job. Bedaux fixes as his unit of work "the amount of work a normal man can do in

one minute when working at ordinary speed in ordinary conditions and availing himself of his full measure of relaxation."¹

For each job there is developed a "B" unit--the standard output for one minute of time, including an allowance for fatigue and unavoidable delays. Sixty B's per hour constitute a 60B hour. This is the standard or required production, for which a guaranteed basic rate is paid. This, however, is not the normal or expected performance, which is generally an 80B hour. If a worker makes an 80B hour he receives a bonus in the nature of a credit for 75 percent of the extra 20 B's. The balance goes to the management and administration on the grounds that they have contributed to the facilities and methods in aiding the worker to earn the bonus. Few companies still operate the original plan, the general practice now being to pay employees the full value of the time saved.²

¹P. K. Standring, "The Bedaux System," Industry Illustrated, May and June, 1934, p. 2.

²"Wage Incentive Schemes" (London: British Institute of Management, 1949), p. 9.

Very much like Bedaux is the Haynes Mani System. Here production is converted into time units called manits, or man-minutes of work. The Haynes system now pays 100 percent for production over task. There are several other unit or point systems, such as the Dyer, Stevens and Norris Plans. These are also outgrowths of the Bedaux or Haynes principle.

Under the Standard Hour Plan a work task is arrived at by time study and expressed in standard hours. The worker is paid a bonus in accordance with the full savings resulting from production above standard.

Plans which have already been mentioned relate the award to the effort of the individual. In many cases in industry, work is done by groups where the individual effort is controlled by the efforts of each of the other members of the group. In order to afford incentive in such situation, many forms of group incentive plans have been developed. The members of a group, for the purpose of an incentive plan, must be within sight and sound of each other and in a position to see how the others are doing; they must all be engaged either in identical work, or on work in a sequence of which part is dependent

upon the part which has been done before; and each worker must be able to control in total his own output.

The Priestman Bonus Plan is a good example of a group incentive plan in use in Great Britain. Under such a plan, standard output is based on weight of the finished product or some other unit of measurement. At the end of a four week period this output of the group is posted, and the earnings of the employee are increased by the same percentage as the output exceeds the standard.

The schemes outlined above usually apply only to direct or productive workers. Many so-called nonproductive operations are no different from productive operations when it comes to incentive treatment. A man (or group of men) is assigned a certain job and the question is whether and when his performance justifies additional compensation. The two large groups of workers included here would be those whose work is essentially of a service nature to production workers, and those whose functions, while essential to the operations of a plant, do not closely or directly influence the performance of the production workers. The first group might include

such as crane operators and inspectors, while the latter group would include such jobs as general maintenance and repair, and construction workers.

With such jobs it is often difficult to establish a practical measure. Generally, however, it is possible to provide a satisfactory yardstick of performance if the problem is approached with the objective of defining the nature of the variables that influence the amount of work required, and then determining the proper relationship and the manpower requirements, rather than with the objective of measuring the particular conditions existing at any moment. Seldom does such a thing as an average condition prevail over any great length of time.

Establishing an incentive plan for a shipping department involves consideration being given to the number of orders shipped, the number of items per order, the weight of shipped orders, the kind of packing or containers, whether shipped by rail, truck, et cetera. If the relative importance of each of these items and the corresponding manpower requirements are determined properly, it is possible to arrive at a formula that includes various factors influencing the day's or week's

actual operation and which will provide a representative index of the worker's productivity.¹

Appendix B shows some standard times for janitorial work developed by E. H. Farmer, Plant Engineer of the Lockheed Aircraft Corporation at Burbank, California. These values will undoubtedly be questioned by most readers, but the writer finds them to be quite accurate.

Many employees in both Great Britain and the United States are paid on the basis of a "sliding scale" system. In some cases the wage rate fluctuates in accordance with changes in the selling price of the product. In other instances the wage rates vary with fluctuations in the cost-of-living index figures.

Systems of remuneration such as co-partnership and profit-sharing are thought by the author to be too remote from individual productivity to warrant discussion as an immediate incentive to work harder. When there are losses or when profits shrink and the amount of

¹"Wage Incentives for Indirect Workers," an address by Albert Ramond, given before the Pittsburgh Chapter of the Society for the Advancement of Management, November 22, 1946.

sharing drops, workers feel that their total earnings have been reduced through no fault of their own. There are too many factors outside the control of the individual.

Merit-rating is another plan of which the value is questioned from the point of view of incentive to increased production. It is a tool for appraising the relative qualities of different personalities with respect to the jobs they fill. Examples of merit rating forms are shown as Appendix C. Since there is ample available printed material on the subject, it is felt unnecessary to go into any detail on the procedure here. A brief discussion is given in the above mentioned Appendix. It seems that unless a scheme is carefully designed and administered, it can result not only in increased cost without commensurate increased production, but can cause a source of irritation which creates more discontent than it does good to productivity.

Many companies have special plans to afford incentive to apprentices and learners. Since a piece rate is discouraging to a beginner and a day guarantee is lacking in incentive, it is desirable to formulate

some plan for inducement during the learning period. The North British Rubber Company, Edinburgh, uses the following scheme (80 percent is taken as day rate):

<u>Efficiency Attained</u>	<u>Efficiency Basis for Bonus*</u>
10	81.5
20	83.0
30	84.5
40	86.0
50	87.5
60	89.0
70	90.5
80	92.0
90	93.5
94	94.0

In many individual plants it was found that supplementary incentives were paid to the workers. For instance they could be paid for quality of the product, for accident prevention, for reducing wasted materials, or for good timekeeping.

It must be remembered when studying a certain plan of wage payment that it will seldom be found in exactly the form in which it was introduced or in which it was installed by its founder. Individual cases may have

*Fifteen percent of efficiency attained is added to 80 percent. It will be noted that when the learner achieves 94 percent the scheme ceases, as the figure achieved equals that given by the scheme.

demanding adaptations to the place that the plan in operation might only remotely resemble the original.

An incentive plan cannot be "lifted" from one company and applied exactly in another with any degree of success. It should be "custom built" to fit a particular company operations.

Table I gives an idea of how extensively the various types of plans are used in the United States. It is a study¹ based on the practices of 259 selected companies.

¹"Wage Payment Systems," National Industrial Conference Board Study #91, 1948, p. 12.

TABLE I

ANALYSIS OF PRINCIPLE TYPES OF INCENTIVE SYSTEMS

Type of Incentive Plan	Number of Companies	Percentage
Individual Incentive Systems:		
Piecework	96	48
Taylor Differential Piece Rate	2	1
Halsey Plan	6	3
Standard Hour	37	18
Point Incentive Wage Systems:		
Modified Bedaux	17	8
Original Bedaux	4	2
Dyer Plan	4	2
Stevens Plan	4	2
Norris Unit Plan	3	1
Miscellaneous (Includes plans not identified in suf- ficient detail to allow classification)	30	15
Group Incentive Systems	56	
	259	100

CHAPTER IV

GROWTH OF INCENTIVE PAYMENT IN GREAT BRITAIN AND THE UNITED STATES

The discussion in this chapter will by no means try to confirm which country was first in establishing or perfecting any phase of modern management regarding wage incentive payment. Rather it will enumerate as closely as possible the dates when certain methods were first used, and will review studies made in each country to show the percentage of workers receiving some form of incentive payment.

Daywork is perhaps older than piecework; however, as early as the 13th or 14th century piecework payment for agriculture work was not uncommon.¹

Among the earliest and most important features of collective bargaining in Great Britain were the piece price lists agreed between a group of employers and

¹"Wage Payment Systems," National Industrial Conference Board Studies in Personnel Policy #91, op. cit., p. 5.

workpeople, determining the prices to be paid for making specified articles or for performing specific processes or operations. As early as 1785, the first agreement was negotiated between the principle master printers of London and a compositor's trade union, setting up "A Scale of Prices." This scale has formed the basis on which printers and compositors are still paid.

In the Sheffield (England) cutlery trade, recognized price lists originated in the first half of the 19th Century. The earliest known is dated 1817, and provides the ground work on which subsequent lists have been based.¹

Other collectively agreed price lists were established in the silk trade in Macclesfield (England) in 1849, in cotton spinning in Bolton (England) in 1858, and in tailoring in Scotland in 1867. These lists were followed in such other trades as boot and shoe making in 1872, tinplate making in 1874, carpet weaving in 1882,

¹Report on Collective Agreements Between Employees and Workpeople in Great Britain and North Ireland, Vol. 1, His Majesty's Stationery Office, London, 1934, p. 14.

shipbuilding (Tyne and Wear List) in 1884, hosiery making in 1886, and lace making in 1889.¹

In the United States price lists govern the pay of many workers in certain industries, but industry-wide negotiation for the establishment of such lists has not been as prevalent as in Great Britain. A good example of one of America's early lists is that negotiated by the National Brotherhood of Operative Potters just before the turn of the century.

In Great Britain the coal mining and iron and steel industries originally used sliding scales based on the selling price of the product in the period 1874-1880. In 1940, this was changed in the iron and steel industry. At this time the basis for wages in the heavy steel trade was changed from the selling price sliding scale to a flat rate cost-of-living index figure.²

¹Report on Collective Agreements Between Employees and Workpeople in Great Britain and North Ireland, Vol. 1, op. cit.

²"Wages in Iron and Steel Industry," Ministry of Labour Gazette, May, 1948, p. 159.

In the United States, there are still some wages pegged to the price of a product. The best known of these are those in which members of the International Union of Mine, Mill and Smelter Workers are paid a variable rate which rises and falls with the price of electrolytic copper, and the agreement by which the members of the Amalgamated Association of Iron, Steel and Tin Workers receive rates depending upon the price of steel bars.¹

There are still a few industries in Great Britain where the collective agreement provides for variation of wage rates in accordance with the selling price of the product. An example is the coke manufacturing in Durham, where the current agreement provides that when the average realized price of coke at the ovens is at or under 18 shillings a ton an addition of 30 percent should be payable to the wage of the workers. Then for every increase of four pence a ton in the price, up to 24 shillings, the percentage addition is increased by

¹Dale Yoder, Personnel Management and Industrial Relations (New York: Prentice-Hall, Inc., 1943), p. 384.

one-half percent, and for every increase of sixpence a ton thereafter by one percent.¹

Such scales do not always reflect the true changes in the cost of living, and offer incentive only from the point of view that the worker feels that he is getting his share of the increased value of his work in proportion to its selling price.

Sliding scales often present serious problems to the industrialist. For example, in Broken Hill, Australia's great lead producing center, the price of lead has developed a variety of financial, industrial and social problems. In 1925, the three big lead mining companies there introduced a "lead bonus" as an incentive to the miners. They agreed to pay the miners sixpence a day for every one pound which lead prices rose above £20 a ton. At this time lead was priced at £22 a ton. The price was so low that between 1926 and 1937, no bonus was paid. Since then the price has soared to £110 a ton and higher, making the incentive system fantastic.

¹"Adjustment of Wages by Sliding Scale Arrangements," Ministry of Labour Gazette, April, 1947, p. 116.

However, because of the agreement, the bonus has been continued.

The scheme has been costing the three companies about £80,000 a week. With all of this money being pumped into a small community, individual incomes have risen to a level out of all proportion to the occupational activities. It is practically impossible for other businesses to get staff to work.¹

A Board of Trade Survey in 1906, showed that the wages of about two and one-half million workers--mainly in the metal, textile, clothing, food and drink, wood-working and furniture, building and allied trades, public administration, transport and other public utilities, varied according to the cost-of-living index.² In 1939, the number in Britain was one and one-half million.³ Most of these used the index of the Ministry

¹"Oh! That Bonus," Birmingham (England) Chamber of Commerce Journal, May, 1949, p. 391.

²Lynton, op. cit., p. 34.

³Monthly Labor Review, September, 1947, p. 287.

of Labour Gazette. During the last World War, there was a further extension of this method of payment, the number of employees whose wage rates were subject to periodical adjustment having grown to two and one-half million by 1947.¹

During World War I, many American companies began using a cost-of-living index, but here the owners of individual companies used an index to reflect local conditions. The plan did not get far in the United States until 1936, when the General Electric Company and many others instituted a plan for automatic adjustment. The indices of the Bureau of Labor Statistics and the National Industrial Conference Board are calculated by locality rather than for the nation as a whole, making it easy for companies to use them if they so desire. There is some lack of confidence in these indices--whether they reflect the actual cost of living.²

¹"Adjustment of Wages by Sliding Scale Arrangements," op. cit.

²C. W. Lytle, Wage Incentive Methods (New York: The Ronald Press Company, 1942), p. 5.

In America, one of the best known cost-of-living schemes is that of General Motors Corporation. The union contract¹ contains a clause showing the increase or decrease in wages resulting from changes in the "Consumers' Price Index for Moderate Income Families in Large Cities," published by the Bureau of Labor Statistics of the United States Department of Labor. It allows one cent (one pence) adjustment for each 1.14 point change in the index.

According to a recent survey, both management and union, in general, are opposed to using such automatic adjustments.²

The foundation of modern wage incentive plans and their technique were laid down by Frederick W. Taylor at the Milvale (Pennsylvania) Steel Company in the early 1880's. However, an early innovation into methods of payment made its way into the cotton spinning industry

¹"Agreement Between General Motors Corporation and the UAW-CIO," May 29, 1950, p. 67.

²R. H. Wood and J. J. Pearce, "The Use of the Cost of Living Factor in General Wage Adjustments," New Brunswick, New Jersey, Rutgers University, 1949, p. 22.

in Oldham, England, as early as 1876. The industry used a task below which piece rates were paid, and above which the worker received a number of constant sharings. For example, if the task was three draws in 50 seconds, every three draws which took 50 seconds or more were paid for by piece rates. If the three draws took the worker only 49 seconds, he was paid piece rates plus one-half the wage saving due to the one second saved. Even though the fact is not generally conceded, either Taylor or Halsey might have taken some inspiration from the plan.¹

Too, the work in scientific management at the Soho Foundry of Boulton and Watt in Birmingham (England) should be mentioned. It is argued that neither Taylor, Ford, nor any other modern experts devised anything in the way of plan that could not be discovered at Soho before 1805.² The methods adopted were limited by many

¹Lytle, op. cit., p. 162.

²Erick Roll, An Early Experiment in Industrial Organization (London: Longmans, Green and Company, 1930).

technical imperfections, but their motives and calculations were surprisingly in advance of the age.

Britain's F. Slater Lewis released a book (Production Management) in 1896, which is claimed to be an advance application of Taylor's later principles.¹

The third quarter of the 19th Century saw a rapid increase in the size of factories, and new equipment created new problems for supervisors of factory labor. This caused special attention to be turned to efficiency systems of wage payment. The only incentive system known was the piece rate, and rapid extension of the use of this system was retarded by labor controversies resulting from the tendency of management to cut the rates in order to get some of the benefits arising from advances in managerial technology. Many new machines were being introduced, and such machines put those concerns which had piece rates at a disadvantage in competition with concerns having time rates, unless the piece rates

¹L. Urwick and E. F. L. Brech, The Making of Scientific Management (Volume II--Management in British Industry) (London: Management Publications Trust, 1946).

could be proportionally reduced.

At first Mr. Taylor set his piece rates on the foreman's estimates. If excessive earnings were made, the rate was cut, causing a constant conflict between management and workers. It was a tendency for the worker to gauge his work to earn as much as he could without getting the rate cut. As a result of continuous trouble between labor and management, there became realization that no one knew what constituted a fair day's work. Taylor at this time set out to establish a system whereby the actual performance of the worker was reflected by the earnings he received. The success of Taylor's work and the publicity it received caused it to be widely sought after in the United States. He emphasized the improvement of tools and methods for each job, the establishment of a high but fair task, the centralization of control, the selection and training of the man for the task, and finally, the reward of a generous incentive.

His system called "a differential rate system of piece work," was initiated in 1884. Taylor's associates, H. L. Gantt and Dwight V. Merrick, modified the Taylor

plan, each in his own way. The Gantt modification proved so successful that Taylor came to use it entirely. In American industry, the Gantt and Merrick plans have largely replaced the Taylor plan.¹ A recently published British book² concluded that the Taylor system has never been used in Great Britain. However, modifications of the plan are used there.

The establishment of the basis for time study by Taylor, and the beginnings of the field of motion study by the Gilbreths in the late 1880's, offered to the field more efficient grounds on which methods of incentive pay could be based.

Profit sharing as a method of payment is among the oldest attempts to depart from the ordinary wage systems, or to supplement them. In Great Britain they go back as far as 1829, and early 1886 in the United States, where a plan was begun at the N. O. Nelson Company, in

¹Lytle, op. cit., p. 178.

²Richard H. L. Lee, Modern Factory Organization (London: Gramol Publications, Limited, 1949, p. 153.

St. Louis, Missouri.¹

As early as 1868, the Pennsylvania Railroad had a plan of profit sharing designed to lessen waste.² However, the best known early plan of profit sharing in the United States was that established by Henry R. Towne of the Yale and Towne Manufacturing Company in late 1886. The plan did not effect day rates or piece rates in any way. Mr. Towne made an agreement with the employees that if credits exceeded profits, he would share half of the profits in the following proportion: 35 to 40 percent to the employees and 10 to 15 percent to the foremen.

In 1942, investigators found 728 companies in the United States with profit sharing plans. Today over 12,000 new plans are in use. For the past three years they have been appearing at the rate of 100 a month; the Bureau of Internal Revenue approved 1,123 new plans

¹Gordon S. Watkins and Paul A. Dodd, The Management of Labor Relations (New York: McGraw-Hill Book Company, Inc., 1938), p. 347.

²The Iron Age, November 20, 1930.

during the year ending June 30, 1949.¹

In 1889, there were 86 profit sharing plans in Great Britain; 63 more by 1892. The year 1890 alone saw the introduction of 32 plans.² However, during the depression which followed, 37 of these schemes failed.³

The British Ministry of Labour has made a study of profit sharing and found that from 1910 to 1929, the number of schemes grew steadily. At the end of 1910, there were 125 plans in operation. Since the end of 1929, the number of schemes in operation has shown a decline each year.⁴ In the United States the rise up to 1929, and the fall since that date have been more distinctly marked than in Great Britain. It was a common practice in America to give workers their profit

¹Roger William Riis, "Firms That Have Joined Hands," The Christian Century, August 2, 1950, p. 920.

²D. F. Schloss, Methods of Industrial Remuneration (London: Williams and Norgate, 1907), p. 262.

³Lynton, op. cit., p. 36.

⁴Florence, op. cit., p. 112.

in form of shares in the company.

A Ministry of Labour study showed that there were 266 schemes in operation in Great Britain in 1937.

The workers under such schemes numbered 223,000, and earned an average bonus of 6.4 percent.¹

Even though profit sharing is not generally looked upon today as a true production incentive, it was necessary to mention it here, because it did start much thinking among industrialists, and undoubtedly had some influence on the inception of the Halsey plan.

In 1890, Frederick A. Halsey, an engineer with the Canadian Rand Drill Company, started what he called the premium bonus system. The plan was quite successful, but little interest was shown elsewhere. In 1898, Messrs. G. and J. Weir of Cathcart, Glasgow (Scotland), introduced a similar scheme, using a 50-50 basis for sharing the savings over task.

The Rowan premium bonus scheme is of British origin.

¹F. E. Gannett and B. F. Catherwood, Industrial and Labour Relations in Great Britain (London: P. S. King and Son, Limited, 1939).

It was initiated by Mr. James Rowan and Sir William Rowan Thomson, both partners at the marine engineering firm of David Rowan and Company, Glasgow. A modified version was later installed at Mavor and Coulson in Glasgow. This premium bonus type of payment is claimed to have received more support in Great Britain than it did in the United States.

According to a study made by the National Industrial Conference Board,¹ covering 631 American manufacturing establishments, employing 700,699 wage earners, 21.6 percent were remunerated by premium bonus systems in 1935. This compares with 12.7 percent in a study made by Sumner H. Slichter in 1924.² A study made by the American Management Association in 1943, showed that 17 percent of the workers studied were under Halsey and other premium methods of payment.³

¹"Financial Incentives," National Industrial Conference Board Studies #217, p. 17.

²Sumner H. Slichter, Union Policies and Industrial Management (Washington: Brookings Institute, 1941), p. 282.

³L. P. Alford and John R. Bangs, editors, Production Handbook (New York: The Ronald Press Company, 1947), p. 1175.

Halsey and his followers were the first to have any degree of success before the advent of time-study.¹

Harrington Emerson, in 1904, became a consultant with the Santa Fe Railroad, after having received early railroad experience in the Yukon. At the time Mr. Emerson came to the new job, the company was having great difficulty with its piece rate system. His new efficiency bonus plan was a means of improving the system of payment. In Great Britain the plan was used in a few cases, but was not thought to have any practical advantage over premium bonus systems.²

The First World War brought with it the pressure for increased production and caused a demand for experts in the field of incentive pay. This overdemand for "efficiency experts" brought to the field many unqualified men and many who were interested only from the viewpoint of "cashing in" on the situation. Each "expert" contrived a slightly different earning curve, labeled it with his

¹ Alford and Bangs, op. cit., p. 1173.

² Lee, op. cit., p. 156.

own name, and applied it to all conditions, in many cases without trying to improve the conditions of work or methods. The evils which were brought to the field from 1915 to 1930, are still remembered by workers who are hesitant to welcome such plans today. However, with improvements in technique, the evils are disappearing.

The point plan made its introduction in 1919, when it was first applied by Charles E. Bedaux. The Mani System made its first appearance in 1925, while the Dyer System was introduced a few years later.¹ Bedaux expanded the use of his plan rapidly and extensively. During the war period, being familiar with installing the Emerson technique, he began installing plans similar to the Emerson plan,² but began with his own plan in 1919. He expanded it in the twenties, and in 1932, he had offices in New York, London, Berlin, Paris, Stockholm, Amsterdam and Sydney. According to his company's records, in 1932, there were in the United States

¹"AFL Report on the Bedaux System," The American Federationist, September 1935, p. 936.

²Lytle, op. cit., p. 224.

120,000 workers in 52 undertakings using the system; in Great Britain the number was 50,000 workers in 30 undertakings. Many types of industries were included-- clothing, chemicals, steel, food, rubber and electrical goods.¹

Because of the rapid spread of the use of the Bedaux system, its installation in so many cases was contested that it soon led to many investigations. Most criticism was caused by the absence of any exact method of fixing output. Many contended that the human was being treated too much like a machine. One investigation² said, "Bedaux's object is to measure the output of energy contained in a piece of work just as mechanical and electrical power is measured." Other investigations include one made by the TUC in Britain³ and by

¹"The TUC Examines the Bedaux System of Payment by Results" (London: Trades Union Congress, 1933), p. 7.

²Dr. Rudolph Schwenger of Berlin, "Report of the Bedaux and Kindred Systems" (London: The General Federation of Trade Unions, 1932), p. 3.

³"The TUC Examines the Bedaux System of Payment by Results," op. cit.

the American Federation of Labor in the United States.¹
The AFL concluded that the Bedaux system ". . . stripped of its pseudo-technical verbiage, is nothing more or less than a method of forcing the last ounce of effort out of workers at the smallest possible cost in wages."

During travels in connection with the research, the writer found several systems of the Bedaux classification, but because of the ill-feeling of workers toward the system, the name Bedaux was never mentioned in connection with the incentive plan.

An investigation made by the American Management Association in 1943, showed that in the United States, 17 percent of all workers studied worked under a Bedaux or similar plan.²

Two studies made in the United States during the twenties indicated the use of wage incentives as follows. In 1924, the National Industrial Conference Board found that in over 1,000 plants, 44 percent of the workers were on incentive. A survey by the Sherman Corporation in

¹"AFL Report on the Bedaux System," op. cit., p. 936.

²Production Handbook, op. cit., p. 1175.

1927, covering 1,100 plants, showed 49 percent on incentive pay.¹

According to a British writer, during the depression of the early 1930's, there was spreading tendency to abandon incentive methods of payment and return to day work. There are many reasons for such a move. In the first place, it was difficult to provide enough work to encourage high productivity. Then management saw that discontinuing the incentive system and releasing the people necessary to operate it could result in lower overhead costs. Also there was a desire for companies to spread the work in order to hold on to key men. This spread in many cases made incentive plans meaningless and unprofitable to maintain.²

Contrary to the above British opinion, a comparison of studies made in the States by the National Industrial Conference Board³ shows that there was very little change

¹H. Diemer, Wage Payment Plans That Reduced Production Costs (New York: McGraw-Hill Book Company, Inc., 1930).

²J. K. Loudon, Wage Incentives (London: Chapman Hall, Limited, 1944).

³National Industrial Conference Board Study #217, op. cit., p. 44.

during the early part of the depression years. One report indicates that in 1932, 35 percent of the workers were on straight piecework and 25 percent were on a premium bonus plan.¹ However, as will be seen later, there was a definite decline after 1935.

In a way, the opportunity to get rid of some of the wage incentive systems during the depression years can be considered a blessing in disguise. With improvements in management technique, as well as a more sound basis on which to establish a fair day's work, the schemes of today are beginning to be looked upon as a technique with a basis, rather than an attempt to "cash in" on something new. In America particularly, the industrial engineer of today has gained respect lost by the "efficiency expert" of yesterday.

Plans with complicated formulas for computing incentive pay are less common today than some years ago. The expansion of the use of incentive payment has caused an equal growth in the techniques for determining what

¹Encyclopaedia of the Social Sciences (New York: The Macmillan Company, 1932), Vol. VIII, p. 679.

constitutes a fair day's work. In early days of incentive plans hardly any attempt was made to test procedures with a view to determine whether all steps were necessary or whether they could be done more quickly by alternative means. Little attention was given to such factors as arrangement of equipment, flow of work, jigs and tools, and other working conditions.

Collective piecework has been used in Great Britain since long before the turn of the century, having been employed in English dockyards and the flint glass trades for about 60 years. In the United States group applications (or gang piecework) were not used to any extent until about 1917.¹ The Priestman plan, one of the best known plans of this type, was originally applied in the engineering works of Priestman Brothers, Limited, Hull (England), in 1917.

A survey made by the National Industrial Conference Board in 1928, covering 777,000 workers in various industrial groups, showed that 10 percent of all workers were on group plans.

¹Lytle, op. cit., p. 312.

During the seven years prior to the entrance of the United States into World War II, there was an indication of a setback in the use of wage incentives. In 1939, a study made by the Conference Board¹ indicated that 51.7 percent of the 4,986,853 employees studied were under incentive, while the percentage in 1935 was 74.6 percent.

The War Production Board in the United States took great interest in the installation of wage incentive plans during the war years. A Management Consultant Division was established to promote wider use of incentive pay. During 1944 alone, approximately one million workers were affected by new plans.² The productivity increase from new incentive schemes in that year is estimated to have resulted in the addition of the equivalent of 400,000 persons to the nation's working force.³ The plans installed in the war years were subject to approval by the War Production Board.

¹National Industrial Conference Board, Study #68, 1945, p. 1.

²"A Handbook on Wage Incentive Plans," compiled by the Management Consultant Division, War Production Board, Washington, D. C., 1945, p. 1.

³Loc. cit.

Some recent studies made by governmental branches in both countries show the number under incentive plans to be comparatively close. For instance, the Ministry of Labour Gazette for October, 1947,¹ shows that of the industries studied, 26 percent were on piece rates or some other system of payment by results. In the United States, the Monthly Labor Review (an organ of the Department of Labor) for November, 1947, states that of the one and one-half million workers studied, about 30 percent were paid on an incentive basis.² Comparative studies as to the use of incentive pay in various industries will be shown in a later chapter.

To get some idea of the use of payment in one particular industry, British engineering has been selected. The changes in method and employment of various wage payment schemes seem to reflect the picture of industry as a whole.

Before 1850, there were only a few branches of engineering in which piecework could be used. Repetition

¹Ministry of Labour Gazette, October, 1947, op. cit., p. 325.

²Monthly Labor Review, November, 1947, op. cit., p. 535.

was extensive enough in trades as textile machine making, locomotive building and manufacture of small arms, sewing machines and cycles. In Scottish centers of marine engineering and on the northeast coast, as well as in the mixed engineering of the London area, piecework was almost unknown in 1850. However, in Manchester and Lancashire it was a practice, and employees were enthusiastic about extending its operation.¹

In 1850, there were two types of piecework in operation. The "gang" system was used in most large jobs, and using this system, it was usual for the work to be "sub-contracted" to a "piece-master." The piece-master employed his own men and paid them day rates until the job was completed, at which time the surplus, if any, of the cost less the wages, was divided among the men according to skill and time worked. This system soon became very unfavorable to the workers. Piece-masters were accused of outright robbery. "They were in the habit of engaging men for about six weeks and then

¹J. B. Jeffreys, The Story of the Engineers (London: Lawrence and Wishart Limited, 1945), p. 63

discharging them in order to avoid sharing the piece money with them and men were discharged if they made any enquiry about the piece money."¹ Many other complaints were made about the piece masters. Some of them were said to have employed skilled men to build the first one of a series of items and dismissed them as soon as the method was formulated. Then boys were employed in order to leave for the piece master a greater surplus on the rest of the contract.

The straight piecework system was also used on many jobs. The price was fixed according to the performance of the best and strongest worker and "he as well as the less skillful man is only allowed to make a certain percentage above his own time wages. If the skillful man takes more than this percentage down comes the price of the article."²

Under the gang system as well as the individual system, the debt system was used. If the time rate was not made on one job, the debt was carried over to the

¹Jeffreys, op. cit., p. 64.

²Loc. cit.

next one. There were times known when a new man on a job started out with a debt left by his predecessor.

A union vote was taken in April of 1851, to cease all piece rate work after April 21. After this time there was a decline in the use of piece rates for some time.

Piecework was not yet a workable system in the engineering industry as a whole. Not many of the shops produced articles which could be put on a piece work basis. In 1886, only five percent of all the men employed in the engineering and boilermaking industries were paid on piecework.¹ After this time piecework was widely spread. In fact, in 1898, the union agreed that every employer could introduce piecework, with prices fixed by mutual agreement. However, the union demanded that all payment should be made through the pay office and not by the individual piece master.² Steps were also taken to prevent continual price-cutting by the employer.

¹Jeffreys, op. cit., p. 129.

²Ibid., p. 148.

The premium bonus system was introduced into the industry shortly after the turn of the century. It was in a way welcomed, because it removed some of the worst features of piece master methods--it reduced rate cutting and instituted a minimum rate of time work, as well as the payment of bonus through the pay office. However, mutuality in fixing the times or prices was originally not part of the system. James Rowan, in 1903, said that workers were not consulted ". . . as it was discovered that none of them knew the length of time it would take to do the work."¹ At one of the shops where the system was introduced (Barr and Stroud, Glasgow), a notice was posted explaining its operation and giving certain guarantees. One article read that "in cases of dispute the matter will be referred to the management whose decision shall be final."²

In 1906, 27.5 percent of the workers in the engineering industry were paid by results, and of this number 4.6 percent were under a premium bonus system.

¹Jeffreys, op. cit., p. 129.

²Loc. cit.

Three years later 9.2 percent of the workers were under the system.¹

The union asked the members to give the system a fair trial. Eventually in 1910, because of protests from the workers, the Trades Union Congress appointed a subcommittee to examine the system, decided against it, and told the men to take a vote on their views of abolition of the system, by strike if necessary. The vote in 1911, was 95,738 for its abolition and only 9,965 in its favor.²

The Monthly Journal of the ASE for the month of August, 1911, declared that "Those who believed that it (premium bonus system) was introduced to benefit the workers must by this time realise that they were either deceived or misinformed premium bonus has only one use it enables the employer to keep back from the worker that which would be his due under piecework system."³

¹Jeffreys, op. cit., p. 129.

²Ibid., p. 155.

³Loc. cit.

Agreement was reached in April, 1919, that any prices or times fixed would enable a worker of average ability to earn 33-1/3 percent above time rates. This established for the first time on a national basis the principle that piece workers were entitled to a definite percentage above time rates. Also in this year the ruling was made that prices once fixed could not be altered except when there was a change in the means or method of production.

The establishment of a fixed percentage over piece rates brought to the foreground the problem of the wages of workers who were on straight time rates. Rates, called "lieu rates"--rates in lieu of piece work--were established to bring the pay of these time workers near to the wages of the piece workers. In addition to this, merit rates were paid to some skilled grades in recognition of their ability.¹

A study made in 1923, showed that in a selection of union firms, 41 percent of the fitters and 51.6 percent of the turners were paid by results. The proportions

¹Jeffreys, op. cit., p. 210.

were 15.6 and 64.6 respectively in 1927. By 1940, these percentages had risen to 80 and 60 percent.

In 1940, 60 percent of all workers in the engineering industry were employed under some sort of payment by results.¹

The 33-1/3 percentage above time rate to be paid to workers on piece rates was cut to 25 percent in 1931. This was later changed to 27-1/2 percent in 1943.

A war bonus was given to the workers in 1915, as an alternative to a direct increase in wages. The term now used is national bonus, and it is still the practice to make cuts and increases in this bonus rather than in the base wage itself. Because of these additions and subtractions, and other crazy percentage "adds and subtracts" many wage structures in Britain have become very complicated. It was amazing to review some of the payrolls at the plants which were visited.

In the latest figures available, the percentage of workers in the engineering industry in Britain on

¹Jeffreys, loc. cit.

some type of payment by results seems to be around 50 percent for the whole of the industry.¹

A recent letter to the writer from Mr. B. Gardner, General Secretary of the Amalgamated Engineering Union, states that ". . . the Union does not now oppose Payment by Result systems. On the contrary, it is very much in favour of them provided they are real incentive systems and not simply a means of speeding up a worker while giving no adequate return to him for his extra efforts."

¹"Proportions of Piece Workers in the Last Pay Week in October, 1949," Ministry of Labour Gazette, March, 1950, p. 86.

CHAPTER V

JOB EVALUATION AND ITS RELATION TO WAGE INCENTIVES

A system of payment designed to offer a financial incentive to a worker in return for efficient work above a specified quantity presupposes that the worker is, in the first place, being fairly and adequately remunerated for his efforts and output, up to and including that specified amount.

The setting up and controlling of a job should contain the following steps:¹

- (1) Invention and construction--including the mechanical engineering functions of development, design, and production of equipment, jigs, tools, gauges and auxiliaries.
- (2) Job standardization--including arrangement, motions and times for efficient production.
- (3) Job analysis.
- (4) Job evaluation.
- (5) Wage incentives.

¹Production Handbook, op. cit., p. 1098.

Not until both the wage structure and the incentive plan have been accurately and equitably established do we have a successful and harmonious wage practice. Job evaluation cannot rightly be excluded.

In a study of job evaluation, there are many terms which must be properly defined. Such terms as job study, job specification, job rating, job analysis, job evaluation, and time and motion study are often used interchangeably. Few writers seem to agree exactly on the meaning of a single term.

Time and motion study are a means of determining the proper way to do a job and the correct time to allow for performing it. Job analysis is a procedure to obtain and record the facts about jobs and operational methods. It seeks answers to the questions: What does the worker do? How does he do it? Why does he do it? What skill is involved in doing it?

From these facts, job descriptions and job specifications are written up. An example of a job description is shown as Appendix D. Job specification is a brief description of the duties of a given job or occupation so prepared to indicate clearly the qualifications a person must possess to perform those duties

satisfactorily.

When all this information is available, we have the basis for weighing the essential characteristics of all jobs in some systematic way to ascertain the labor worth of each job relative to all others. This is job evaluation.

Since in most well defined incentive plans the time rate for the job is a factor in determining incentive earnings, the relationship of job evaluation to the incentive plan is very important. The first evaluates the qualitative part of the job and the latter the quantitative part.

Job evaluation plans in use today fall into one of four categories:

- (1) The ranking method
- (2) The grading method
- (3) The factor comparison method
- (4) The point method.

It is beyond the scope of this investigation to examine all the methods in detail. The reader should refer to the many books on the subject by American

writers.¹

Evaluation plans based on some form of a point system have enjoyed so much popularity that they make the use of other methods almost negligible in the United States. Mr. A. F. Stewart of the British Institute of Management states that the great majority of companies in Britain use the point system as well. He says further that from the proceedings of the recent International Conference on Job Evaluation at Geneva, it seems clear that this prevails generally in all Western European countries.

Job evaluation is not something altogether new. Instead it is just a new name for a technique that has been practiced since man first started working for hire.

¹C. C. Balderston, Wage Setting Based on Job Analysis and Evaluation (New York: Industrial Relations Counselors, 1940); E. J. Bengt, Principles and Procedures of Job Evaluation (University of Minnesota, 1944); F. H. Johnson, R. W. Boise, Jr., and D. Pratt, Job Evaluation (New York: John Wiley and Sons, Inc., 1946); P. W. Jones, Practical Job Evaluation (London: Chapman and Hall, 1948); C. W. Lytle, Job Evaluation Methods (New York: Ronald Press, 1946); R. C. Smyth and M. J. Murphy, Job Evaluation and Employee Rating (New York: McGraw-Hill Book Company, Inc., 1946); H. G. Stanway, Applied Job Evaluation (New York: Ronald Press, 1947).

A thousand years before the birth of Christ, Solomon built a temple which took seven years to build. Even at this time Solomon had the workers classified into three groups--relative to laborers, mechanics and supervisors. In the modern sense, evaluation represents a formalized approach to a problem handled in the past by rule of thumb.

Down through the ages, until Taylor's day, wages were determined by make-shift methods. Taylor laid steps for establishment of a standard time for production of a unit. This was certainly a step forward.

During the present century, both labor and management have shown increasing interest in a scientific plan for establishing comparative base rates for various jobs. As early as June, 1921, the American Federation of Labor asked its executive council to attempt a job analysis program. And by 1924, the American Management Association had shown a growing interest in the subject of job analysis, the interest soon bringing out discussion on job evaluation.¹

¹E. J. Benge, Manual of Job Evaluation (New York: Harper and Brothers, 1941), p. 14.

One of the earliest wage surveys by job analysis was conducted by the Mead Pulp and Paper Mill at Chillicothe, Ohio, in 1921. The company used the assistance of the consulting firm of Scott, Clothier, D. G. Paterson and Associates. The factors used in the rating were (1) responsibility for supervising and training others; (2) responsibility for equipment; (3) responsibility for quality of product, service, and good will; (4) responsibility for waste; (5) training and experience required; and (6) working conditions.¹

In May, 1925, the American magazine Management and Administration carried an article entitled "Wage Scales With a Reason" by Merrill R. Lott. During the following year, Mr. Lott released a book called Wage Scales and Job Evaluation. Most of the point systems in use today are an outgrowth of this publication.

The first extensive movement toward modern job evaluation as a scientific approach for setting basic wage differentials began about 1930. Since that time

¹Z. C. Dickinson, Compensating Industrial Effort (New York: The Ronald Press Company, 1937), p. 196.

an ever increasing number of companies have adopted the system. In a survey made by the National Industrial Conference Board in 1939, about 13 percent of the companies surveyed were using job evaluation.¹

The technique of job evaluation took an increased importance in the early 1940's. The American War Labor Board's approval of the evaluation methods encouraged management and labor organizations to work together to establish job evaluation programs. The offices of the Board were deluged with inquiries of interest. As was true with the Board's approval of wage incentives, the motive for a sudden swing may have been for the purpose of making wage increases under the wage stabilization laws, but it is now recognized as a sound, systematic approach to base wage rate establishment.

A survey by the National Industrial Conference Board made in 1947,² shows that 57 percent of the 3,498

¹"Personnel Activities in American Business," Studies in Personnel Policy #86, National Industrial Conference Board, New York, 1947, p. 12.

²National Industrial Conference Board Study #86, op. cit., p. 29.

American companies studied were using job evaluation. A significant point about the swift expansion is the fact that the plans are equally distributed among small, medium, and large concerns, and among companies in all the industrial classifications covered by the survey.

To get a general idea of the use of job evaluation in certain industries in the United States, a portion of the NICB report is shown in Table II.

During the writer's travels in Great Britain, he found very little being done in the field of job evaluation. The literature from the British point of view is very limited, except for a few pamphlets describing schemes of individual firms. Some of the later books contain brief discussions of job evaluation, but none of them go too far into detail. Mr. J. J. Gracie's recent book¹ has quite a good discussion.

As a result of a discussion of job evaluation at a meeting of the British Institute of Management at Cliftonville (England), May 5-8, 1949, a Job Evaluation Panel, under the chairmanship of Mr. J. J. Gracie of

¹ Gracie, op. cit., Chapter IV.

TABLE II

COMPANIES UTILIZING JOB EVALUATION PLANS

Individual Group	Number of Cooperating Companies	Job Evaluation for Hourly Workers	
		Number of Companies	Percent of Total
Automobiles	92	58	63.0
Building	107	41	38.3
Coal	27	5	18.5
Food and Beverages	198	99	50.0
Glass	27	12	44.4
Metals	582	334	57.4
Paint, Varnish, etc.	30	12	40.0
Paper	189	101	53.4
Printing and Publishing	90	24	26.7
Rubber	59	40	67.8
Shipbuilding	26	9	34.6
Textiles	250	119	47.6

General Electric Company, was set up to examine the possibilities of establishing a job evaluation program for all industries on a national basis. At the present time, the research staff of the Department of Engineering Production in the Birmingham (England) University is making a comparative study of job evaluation practices in a number of British companies. The panel, according to one of its members, Mr. A. F. Stewart of the British Institute of Management, hopes shortly to be in a position to publish an interim booklet on job evaluation practices in Great Britain.

There are several advocates of a job evaluation program on a national basis in Britain. The first account of such a move seems to have been made by Mr. C. A. Lidbury in early 1946.¹ Mr. Lidbury suggested that all basic industries be treated first, while the rest would be grouped together under the two categories "ancillary" and "luxury and entertainment."²

Mr. Gracie seems to have come into the lead in

¹See The Observer, July, 1940.

²C. A. Lidbury, "A National Wages Policy," 1947, p. 26.

the field today. He thinks that since we now compare objectively the job values of such diverse jobs as laborers, capstan operators, electricians, storekeepers, and inspectors, these same factors can be used to find the comparable value of any other job in the engineering industries. Then, he relates, it is only a problem of simple extension of the same system to evaluate jobs in any other industry. There are common occupations in every industry, and using these as common denominators, the framework of a uniform system for every industry would be established.¹ A report by Mr. Gracie's panel is eagerly awaited.

Perhaps the most outstanding and extensive scheme of job evaluation in Britain at the moment is that of the Imperial Chemical Industries, Limited. According to Mr. A. H. Merrie of the Central Labour Department of that company, the method has now been applied throughout the organization to all process jobs. A brief outline of the method used is shown as Appendix E. Another

¹"Job Evaluation," being a report of a conference sectional meeting, British Institute of Management, May 5-8, 1949, pp. 5-7.

outstanding British scheme is that of Mars, Limited of Slough (England). The Mars procedure has been so widely publicized that a summary of the scheme is unnecessary.

Probably the best known systems in the United States are those of the National Electrical Manufacturers Association (later adopted by the National Metal Trades Association), General Electric Company, Westinghouse Electric and Manufacturing Company, and the United States Steel Company. Table III shows the lack of uniformity of these systems regarding the points attributed to each quality of the worker.

A study by the National Industrial Conference Board in 1940,¹ found the factors of its sample to be distributed as follows:

<u>Characteristic</u>	<u>Range of Importance</u>	<u>Median Importance</u>
Skill	40.0-64.3%	50%
Effort	10.0-21.0%	15%
Responsibility	20.0-27.8%	25%
Working Conditions	10.0-20.0%	11%

The National Electrical and Manufacturers Association estimates that its plan has been installed

¹National Industrial Conference Board, Studies in Personnel Policies #25, September, 1940.

TABLE III

PERCENTAGES ATTRIBUTED FOR EACH QUALITY IN
FOUR JOB EVALUATION SCHEMES¹

	NEMA - NMTA *	General Electric	Westinghouse	United States Steel
Skill	50%	62½%	60½%	45%
Effort	15%	12½%	22½%	16%
Responsibility	20%	12½%	13½%	24%
Working Conditions	15%	12½%	3½%	15%

*National Electric and Manufacturers Association and National Metal Trades Association.

¹"UE Guide to Wage Payment Plans, Time Study and Job Evaluation," United Electrical, Radio and Machine Workers of America, 1943, p. 73.

in almost 1500 plants. The National Metal Trades Association has alone installed it in over 500 plants.

Of the four outstanding schemes mentioned, the author is most familiar with that of the United States Steel Company, since a portion of the negotiation and installation took place during his experience with the American Bridge Company, a subsidiary where the scheme has now been completed.

After almost two years of constant negotiation, United States Steel Corporation and the United Steelworkers of America (CIO) signed the agreement for the job evaluation study on January 13, 1947. The purpose of the agreement was to eliminate wage inequities and job title inequities among the different companies. Wage rationalization on such a large scale represents an application of industrial engineering and collective bargaining without parallel in American industry.¹

More than 60 companies, operating over 200 plants throughout America, established, for the first time,

¹"The Wage Rationalization Program of United States Steel," Monthly Labor Review, June 1947, p. 967.

a set of standard hourly wage scales for steel-making workers. This same system is now being used by all but a few of the nation's basic steel plants. Mr. J. C. Sears, Manager of the American Associated Consultants, Inc., the Pittsburgh organization administering the plan, estimates that it now covers about 650,000 steel workers throughout the United States.

An illustrative job description for the scheme is shown as Appendix D. All jobs are described so as to contain the following particulars:

- (1) Job title
- (2) Department and sub-division
- (3) Primary functions of the job
- (4) Source of supervision
- (5) Tools and equipment used
- (6) Materials used, processed and handled
- (7) Duties and working procedures

All observations for the description of operations are made in the presence of supervision. The description form is prepared in duplicate, and both completed copies are given to the department superintendent, who in turn transmits one copy to the Grievance Committeeman for

that particular department. The committeeman promptly reviews the job description with workers employed on the jobs involved. If approved, one copy goes to the union staff representative and the other to the Industrial Engineering Department for custody. If the description is not approved, the committeeman and Department Superintendent endeavor to agree, but if agreement is not reached, the task of negotiations goes to the Wage Rate Inequity Committee for final decision.

For the evaluation of jobs, a manual was developed by representatives of a group of steel companies, including United States Steel. A copy of the manual is shown as Appendix F. As will be seen, the manual rates the job content by twelve factors, with the following as maximum points:

<u>Factor</u>	<u>Maximum Weight</u>
Pre-employment Training	1.0
Employment Training and Experience . .	4.0
Mental Skill	3.5
Manual Skill	2.0
Responsibility for Materials	10.0
Responsibility for Tools and Equipment	4.0
Responsibility for Operations	6.5
Responsibility for Safety of Others .	2.0

<u>Factor</u>	<u>Maximum Weight</u>
Mental Effort	2.5
Physical Effort	2.5
Surroundings	3.0
Hazards	2.0

The degree of each of the factors is defined, not so much in terms of single generalities, but rather in terms of listing typical job situations, and further by showing some benchmark jobs.

The negotiations for the evaluation portion of the program are somewhat the same as that for job description. Two committees of not more than three members, one from management and the other from the union, are established. If agreement is not reached by both committees, the matter goes to the Wage Rate Inequity Committee for final negotiations and approval. Page 2 of Appendix D shows an illustrative copy of the evaluation.

The points for each of the twelve factors are added, and any portion of a point is changed to the nearest whole number in determining the job class.

The job class finally agreed upon determines the rate of the base pay for a job. The classes increase

by increments of 4.5 cents ($4\frac{1}{2}$ d.) from Job Class 1 to Job Class 30, beginning with the hourly base rate of \$1.185 (8s. 6d.) for Class 1, and so on as follows:

<u>Job Class</u>	<u>Standard Hourly Wage Rate</u>
1	\$1.185 (8s. 6d.)
2	1.230 (8s. $9\frac{1}{2}$ d.)
3	1.275 (9s. $1\frac{1}{2}$ d.)
.....
10	1.590 (11s. $4\frac{1}{2}$ d.)
.....
20	2.040 (14s. $6\frac{1}{2}$ d.)
.....
30	2.490 (17s. $9\frac{1}{2}$ d.)

Every aspect of a job evaluation program demands patience, tolerance and persistence on the part of management, employees and those designing and administering the plan. Even though the initial negotiations for the United States Steel program began in 1944, the program was not completed at the Bridge Company until May, 1949.

All industrialists are surely aware of the fact that employees are forever making comparisons between

their job and pay of their fellow workers. Unless the pay conditions have been established by a sensible yardstick, discontent, dissension and low productivity are often the result.

Job evaluation cannot mend all of the sources of trouble, but it can be a very effective instrument if both labor and management recognize the importance of the work involved.

The procedures of job evaluation are systematic, but they cannot be classified as a precise, infallible method of measurement, since the basis for the system is human judgment. And thus far, no one has succeeded in measuring human judgment with exactness. Such factors as the skill and degree of responsibility involved in a particular job do not lend themselves to precise measurement. However, the process of analysis can be so refined that the error in human judgment is greatly reduced.

The installation of a job evaluation program involves much more than selecting and using a standard procedure. Since it involves a man's "take home" pay, it must be sold in order to obtain employee

cooperation. The worker should be acquainted with the basic principles of job evaluation, convinced of its fairness, and informed of its progress.

No hint should be made to the worker that job evaluation is a cure for all wage ills, and no indication should be made that the program will mean general raises.

CHAPTER VI

THE PROBLEM OF INSTALLING AN INCENTIVE PLAN

A discussion of the problems of selecting an incentive plan is difficult when treated in a general way, but it is a comparatively simple thing when the discussion is brought to a specific case. However, some authorities have attempted to lay down some general lines of selection.

A useful aid in analyzing wage problems is consideration of the extent to which the problems are directly connected with particular production situations.

A certain incentive plan cannot be "lifted" from one company and applied to another with any degree of success. It must be "tailor made" to fit the conditions at hand. Workers at one plant may be little more than attendants at an automatic line operation where little control over the volume of output can be executed. At another plant, output might be entirely dependent on the individual effort of skilled manual workers. Individual problems of manufacturing process, the type

of labor used, and the expense of installing a certain system might have much bearing on the use of incentive payment at a given company.

Types of production are usually classified into three or four groupings, as follows: (1) job production, (2) batch production, (3) process production, and (4) mass production.

Job production can be defined as the case where each job or order stands alone and is unlikely to be repeated in all particulars. Ships, power plants and large buildings are typical, as are luxury furniture and clothes made to individual design.

A small stainless steel specialty company in Edinburgh, employing less than fifty direct workers, receives so many one lot orders of items which are not likely to be repeated, that it was found unfavorable to employ any type of individual incentive scheme. However, in February of 1948, a group bonus scheme, based on the value of business over a set minimum amount, was initiated. The bonus, based on the average value of business over a three month period, is paid to the workers the second week of each month. Each

productive worker is paid on the basis of percentage of his pay to the total payroll. Even though there have been two months when no bonus was earned, the plan has been extremely favorable, and the managing director of the firm states that the scheme has had a marked effect on the attitude and productivity of every worker in the plant.

In batch production there is not continuous production of products of strictly identical character. The batches are usually large enough to form a substantial part of the work going on in the plant at one time, but since repetition of the exact article is not probable, extensive arrangements for reducing cost of production per unit are not justified. Batch work can vary from the making of watches to the building of houses, from the manufacture of shoes to the assembling of engines.

Process production cannot be fully controlled by the operator since here the time taken is determined by chemical or physical consideration.

Mass, repetitive, or flow production may be described as the manufacture of products of strictly

identical character, being made by continuous production. Each processing unit is continuously concerned with the same product without any change.

It is difficult to make generalizations in recommending an incentive plan for the various types of production. The British Institute of Management has laid down some general line of selection as shown in Table IV.

In a large proportion of production work the amount of output varies directly with the effort and speed of the operator. In such cases output can be measured with considerable accuracy. Where the operations are reasonably repetitive, and where methods are fairly well established, and materials, tools, and working conditions are standardized and uniform, and a steady flow of work can be provided, good time study techniques should result in accurate time standards. Under such conditions, it is easy to select a plan that will pay the operator fairly.

In many production processes the rate of output may be hindered by certain factors beyond the control of the operator. For example, it might be impossible to supply a steady flow of uniform materials. Previous

TABLE IV

SELECTING THE RIGHT SCHEME¹

Type of Production	Examples	Type of Incentive Scheme
Jobbing - 1 off Very small batch Batch Production	Heavy engineering; repair shop Medium and light engineering; leather goods; electrical equipment; shoes	Estimated piece rates; Rowan; Halsey Point systems based on time study or estimated piece rates, dependent on length of batches
Repetition Work (mainly hand operated or assembly, done individually)	Small electrical parts; radio sets; clothing	Point systems based on careful time and motion study
Repetition Work (mainly controlled by machine times)	Weaving; standard engineer's parts; electric lamps	Point systems or piece rates based on calculated machine times
Flow Production (workers dependent on previous operations. Conveyor)	Small standard assemblies; food canning and bottling. Sawmills.	Group bonus, to include labourers. Based on conveyor speed or work study
Where untrained labour is being used, the Emerson Efficiency Method is sometimes useful as an intermediate stage to a complete incentive application.		

¹"Wage Incentive Schemes," British Institute of Management, London, op. cit., p. 13.

operations might not be well controlled. Too, on such operations as grinding, the amount of stock to be removed may cause the required time to vary. In such cases, some group sharing plan might be most effective.

Where the rate of output is fixed or limited by capacity of the machine or by process, the maximum rate can be determined with reasonable accuracy. Management might encourage operators to meet certain standards of performance. Or it might be company policy to control performance to guard against a pace that would become physically or mentally disturbing to the worker. Under such conditions, the wage incentive plan should encourage the worker to maintain certain working conditions. A multiple time plan, with a step-incentive, paid when the operator reaches 100 percent of standard, would accomplish the desired results.¹

Establishing a Time Standard

Mention has been made before of the specified

¹H. B. Rogers, "Which Incentive Plan is Best for You?" American Machinist, October 10, 1946, p. 104.

quantity above which the worker receives incentive pay. The only true way to establish this specified quantity is by time study. However, in standardizing a job for time study, other techniques must be considered. One is the process chart, defined by the Gilbreths as a device for visualizing a process with a view of improving it. A process chart is used as a technique to find the best sequence of work. It is a rough tool of measurement, but is particularly useful in analyzing operations of a non-repetitive nature, or in cases where the cycle time is of long duration.

A second technique involves micromotion photography, when a film is made of a job. The film is then projected and analyzed. However, this gives no measurement of the path through which a hand moves, making a need for the third method--a chronocyclegraph study. A stereoscopic picture is made of the cycle of movement by using lights that blink on quickly and go off slowly. Appendix G contains further discussion of the procedures of these techniques, as well as the procedures of time study.

The two functions, time study and motion study, are often confused. Too often they are thought of as

one subject, and used as one tool of management--time and motion study. The two are quite distinct, but they are complementary to one another. The application of motion study necessitates the use of time study, and time study is useless without motion efficiency.

Volumes have been written on all the three functions--process charts, motion study, and time study--but it is felt that because of the importance of the techniques to the field of wage incentives, a brief discussion is essential here. Philip Murray and Morris Cooke recognize this fact in their recent book.¹ They state, ". . . the method of payment matters little as compared with the method of determining the standards upon which the wage is based."

"Time study is a symptom of the growing rights of labor for a correct measurement of output standards," says one British writer.² It seems that nearly every

¹M. L. Cooke and Philip Murray, Organized Labor and Production (New York: Harper and Brothers, 1940), p. 116.

²F. W. Deakin, "Equal Reward for Equal Effort," pamphlet, 1945.

person wants to know what is expected of him--whether he operates a machine or manages a plant. It is just human nature to want some means of measuring accomplishments. An example of this which is close to us in the educational field is that in our school systems grades let the student know how he is doing.

Time study is actually much older than is generally thought. As far back as 1760, the Frenchman, M. Peronet, studied the manufacture of pins and discovered that it took 24.3 hours to make 12,000 number 6 pins!¹

Long before time study had achieved the significance it gained in the Taylor system of scientific management, there were in British engineering works those who were called "feed and speed" men, whose duties were to see that machines were being run at the right cutting speed and feed, which largely controlled the time required for an operation. The extended use of incentive payment resulted in the development of these "feed and speed"

¹"Industrial Engineering Department," North British News, employee publication of North British Rubber Company, Edinburgh, Scotland, February, 1950, p. 3.

men into rate fixers, who began to fix the time allowed for a given operation rather than the feeds and speeds to be used.¹

Formal time study, it is agreed, had its beginning in the machine shop of the Milvale (Pennsylvania) Steel Company in 1881, with Frederick W. Taylor as its originator. Undoubtedly Taylor used motion study to some extent in connection with his time study techniques, but the origin of motion study as we know it today is credited to the late Frank B. Gilbreth and to his wife, Dr. Lillian M. Gilbreth.

Taylor's methods immediately led to much suspicion from workers, who contended that he was merely trying to squeeze more work from the men, and that his studies were far from scientific. Continuing complaints resulted in an investigation before a special committee of the United States House of Representatives on January 25, 1912. During the course of the investigation, Taylor tried to prove that the greatest obstacle to efficient

¹E. T. Elbourne, Fundamentals of Industrial Administration (London: Macdonald and Evans, 1947).

production was loafing or "soldiering," marking time as he called it. In England, Mr. Taylor explained, it was called "hanging it out" and in Scotland "ca' cannie."¹ His objective was to prove that scientific methods of measurement would seek improved methods at a pace which was not injurious to the worker.

The purpose of time study is to set a time standard for a given job. It is used either for planning purposes, or as a yardstick for the measuring of actual performance--output control or for the determination of a worker's wages.

Time study comprises four steps:

- (1) Actual time taken
- (2) Rating speed and effort
- (3) Fatigue allowances
- (4) Allowances for delay factors that usually accompany the operation.

In determining the time standard, the engineer is making his conclusions as to what constitutes a "fair

¹Taylor's Testimony Before the Special House Committee (New York: Harper and Brothers, 1912).

day's work." The American Associated Consultants, Inc., of Pittsburgh, Pennsylvania, the firm which set the yardstick for the job evaluation program of the United States Steel Corporation, as well as the publishers of a manual of procedure for the time study of production and maintenance jobs for the company, has drawn the following definitions in making job studies. A "fair day's work" is defined as the amount of work that can be produced by a qualified employee when working at a normal pace and effectively utilizing his time where work is not restricted by process limitations.

A "qualified employee" is understood to mean a representative average of those employees who are fully trained and able satisfactorily to perform any and all phases of the work involved, in accordance with requirements of the job under consideration.

"Normal pace" is understood to mean the effective rate of performance of a conscientious, self-paced, qualified employee when working neither fast nor slow and giving due consideration to the physical, mental, or visual requirements of the specific job. For example, a man walking, without load, on smooth, level ground

at a rate of three miles per hour.

"Effectively utilizing time" is understood to mean the maintenance of a normal pace while performing essential elements of the job during all portions of the day except that which is required for reasonable rest and personal needs, under circumstances in which the job is not subject to process, equipment, or other operating limitations.

The consulting firm has proved that the average group of qualified employees consistently can perform about one-third, or approximately 35 percent above the level of a fair day's work on jobs that do not contain limitations.

The first step of time study is an easy matter. The observing of an employee at work and determining the actual time taken by him to perform a given task requires only the reading of a stop watch. The difficult part comes when determining the time that would be required if the task were performed at the normal pace of a fair day's work.

If the employee being studied works at a normal pace when the actual time was determined, such actual

time noted from the stop watch equals the time that would be required to perform the work at normal pace. However, such simplification is not possible in practice. The pace at which work is performed varies not only between individual employees, but any given employee may vary the pace at which he performs various elements of work on the job, and from time to time an individual employee may vary the pace at which he performs a given element of work. These differences may be caused by various things. For instance, it might be a result of the training and skill of the employee, the effort exerted, the physical condition or attitude at the moment, or a combination of circumstances peculiar to the situation at hand.

At the Bridge Company, the performance which reflects the rate of a fair day's work is designated at 100 percent. Naturally, a pace which is considered 30 percent better than normal is called 130 percent efficient. Determination of the rating factor for skill and effort is probably the most difficult part of a time study. It depends entirely on the judgment of the observer. The Bridge Company uses the following

table (Table V) in arriving at the rating factor. Say, for example, the observer finds that the effort exerted by the worker was excellent, and that his skill in doing the job was just fair. Using Table V, we find that the rating factor would be 113 percent. Accurate and precise rating of a worker takes much training and a thorough knowledge of the type of work being rated. The writer has found during his experiences that the variations in rating of a single definite operation at a given time by six observers will in many cases result in six ratings. It is surprising, though, how close the ratings will be in some cases.

There are several methods used in arriving at the rating of an employee at work. One of the most common is for the observer to determine the rating factor for the operation as a whole. Some plants follow the rule of having the observer determine a rating factor for each element of the operation. Another method which is used less frequently is that of rating each element when it is timed, the observer recording the rating for the element on the observation sheet when the stop-watch reading is recorded. This last method is very difficult

TABLE V

EMPLOYEE RATING--SKILL AND EFFORT
(Used by American Bridge Company)

Skill	Effort					Killing 166%
	Poor 60%	Fair 80%	Average 100%	Good 120%	Excellent 133%	
Poor	36	48	60	72	80	100
Fair	51	68	85	102	113	141
Average	60	80	100	120	133	166
Good	66	88	110	132	146	183
Excellent	72	96	120	144	160	199
Superior	78	104	130	156	173	216

when the elements are short.

A recent survey¹ of 744 time study men showed that 34 percent rated the over-all study, 54 percent rated each element, and 13 percent rated each stop watch reading.

Industrial fatigue is a subject to which much study has been devoted. A great number of experiments and investigations have been made in Great Britain and the United States. But so far the findings have not been of any great assistance to the time study man in setting better standards. To date, no one has discovered a practical means for measuring fatigue from physical effort, and the amount of fatigue from mental effort is anyone's guess.

The amount of required effort and the working conditions of the job involve varying needs for rest to enable an employee to perform consistently at or above the normal pace of a fair day's work. A certain amount of physical relief is necessary for personal needs. There are many methods of concluding the amount of time

¹Ralph M. Barnes, Motion and Time Study (New York: John Wiley and Sons, Inc., 1949), p. 349.

allowed for these factors. Some plants have a set percentage of the total time. This percentage is often set by departments within the plants. For instance, the riveting department allowance might be 20 percent, while the allowance in the templet shop might be only five percent.

Examples of allowances used by the United States Steel under the new "fair day's work" program¹ are shown in Tables VI and VII. Percentage allowances are given for different degrees of physical work, and at the same time bench mark jobs are given as guideposts. These allowances are thought adequate to cover the necessary rest and personal needs required under normal working conditions of steel producing jobs. The second table takes into account the nature of the employee's actual exposure to the conditions of abnormal heat. Bench mark jobs are also given for these conditions.

Further allowances must be made for idle time, or delays which usually accompany the operation. Idle time

¹"Manual of Procedure for the Time Study of Production and Maintenance Jobs" (Pittsburgh: American Associated Consultants, Inc., 1948), pp. 11-14.

TABLE VI

ALLOWANCES FOR REST AND PERSONAL NEEDS

Class of Work Code No.	Examples of Bench Mark Elements	Allowance for Rest and Personal Needs in Per Cent of Normal Time for the Given Element
1	<p><u>Minimum Physical Work; Attention Unaccompanied by Physical Work; or Attention Accompanied by Subordinate Amount of Minimum or Light Physical Work</u></p> <p>Perform work involving the use of small tools or light materials which may include moving about in a restricted area, for example: brush; stencils; mark with chalk or crayon; attach tags to bundles; light assembly; manipulate variable controls such as crane type controls; light grinding on pedestal grinder; ram small cores; observe (sitting or standing); record data; operate push button controls; gauge wire; open and close valves (one hand); instrument assembly and repair; hand feed or position light weight material for punching, forming or shearing; spot weld small parts in sub-assembly operation.</p>	10

NOTE: Special or unusual conditions of extremely heavy physical work may require special analysis and handling, in relation to the above table, on the facts of the particular element of work.

TABLE VI (continued)

ALLOWANCES FOR REST AND PERSONAL NEEDS

Class of Work Code No.	Examples of Bench Mark Elements	Allowance for Rest and Personal Needs in Per Cent of Normal Time for the Given Element
2	<p><u>Light Physical Work; or Attention Accompanied by Subordinate Amount of Moderate Physical Work</u></p> <p>Perform light work involving the use of light tools and material; light pushing or pulling, which includes stooping, reaching, and lifting, for example: walk with or without light, load; sweep and mop; flop tin plate; grease hot beds; push empty wheelbarrow or hand truck; hand scarf, weld or burn; drive nails in making crates; pointing #5 rod in roll pointer; operate floor type control levers; lift and position medium-sized parts on machine, bench or conveyor.</p>	15
3	<p><u>Moderate Physical Work; or Attention Accompanied by Subordinate Amount of Heavy Physical Work</u></p> <p>Perform moderately heavy work involving the use of tools and materials requiring considerable effort, for example: lift or carry moderately heavy material; hand saw wood; climb with or without light load;</p>	20

TABLE VI (continued)

ALLOWANCES FOR REST AND PERSONAL NEEDS

Class of Work Code No.	Examples of Bench Mark Elements	Allowance for Rest and Personal Needs in Per Cent of Normal Time for the Given Element
4	<p>manually load brick on conveyor; light sledging (one hand); heavy filing with large hand file; turn large billets with wrench; catch and loop sections on merchant or rod mill.</p> <p><u>Heavy Physical Work; or Attention Accompanied by Subordinate Amount of Extremely Heavy Physical Work</u></p> <p>Perform heavy work involving the use of tools and materials requiring strenuous effort, for example: shovel heavy materials such as sand, slag or scale; use pick or heavy bars; heavy lifting such as handling sacks of cement; heavy sledging (two hands); operate heavy portable hand tools for chipping, grinding, or riveting; push fully loaded wheelbarrow of concrete.</p>	30

TABLE VII

ALLOWANCES FOR HEAT EXPOSURE

Working Condition Code Number	Description of Working Conditions	Conversion Factor
A	Normal working conditions of heat.	None: Use Table VI allowances
B	Exposure to conditions of high air temperature that are considerably in excess of those present in areas not affected by process induced heat.	1.5: Multiply Table VI allowances by 1.5 and, if necessary, round out to next lower multiple of 5%.
C	Direct exposure to conditions of heat equivalent to that at a point 5 feet from a large area of steel at dull red to black heat; plates, sheets, structural sections on cooling beds, coiled strip and rods on mill discharge conveyor.	2.0: Multiply Table VI allowances by 2.0.
D	Direct exposure to conditions of heat equivalent to that at a point 10 feet from a large radiating surface at rolling temperature; ingots, large slabs, etc.	3.0: Multiply Table VI allowances by 3.0.
E	Direct exposure to conditions of heat equivalent to that at a point 5 feet from a large radiating surface at rolling temperature; ingots, large slabs, etc.	5.0: Multiply Table VI allowances by 5.0.

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Tin Plate Inspection	Assorter	<u>Condition A</u> Flop and inspect tin plate.	Normal room temperatures.
	Scarfer		Some radiation from torch and scarfed billet.
Billet Conditioning		Operate hand held scarfing torch to remove defects from cold billets.	
White Pickler	Unloader	Carry lift of tin plate from cage to box.	Normal room temperatures, considerable wetness.
Mechanical	Brick Unloader	Manually lift brick from pile in car and place on conveyor.	Normal atmospheric conditions.
	Machinist	Chuck up piece in lathe.	Average machine shop conditions.
Soaking Pits	Recorder	Record heat information on blackboard.	Not materially affected by process induced heat in department.

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Open Hearth	1st Helper	<u>Condition A (continued)</u> Observe test sample for carbon.	Not materially affected by process induced heat in department.
Annealing	Normaliz- ing Piler	<u>Condition B</u> Use 3 ft. tongs to slide hot sheets of roofing from dis- charge conveyor, pile in stack at end of conveyor. Element consists of time while actually holding sheet with tongs. When sheet is released the man steps away from heat.	Exposed to heat from hot sheets on conveyor and on pile. Too far from furnace to be ex- posed to furnace heat.
Open Hearth	1st Helper	Observe furnace roof and bath through peep hole in water cooled door.	Exposed to high atmos- pheric temperature.

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Sheet Galvanizing	Potman	<u>Condition B (continued)</u> Stand beside large pot of molten spelter. Use skimmer (6 handle). Skim kettle, add flux and spelter. (Time while actually at side of pot.)	Exposed to heat from molten spelter. Not direct exposure as man stands by side of pot about waist high.
	Pipe-fitter or Millwright	Change doors on open hearth.	Exposed to heat from furnace in removing and replacing charging doors.
Strip Mill	Coil Bander	<u>Condition C</u> Band hot coils.	Exposed to dull red to black heat from coils to be banded.
Billet Mill	Marker	Hold chalk in hand, bend over material and mark identification on top of	Exposed to large area of steel at black hot temperature. Billets

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Billet Mill	Hooker	<u>Condition C (continued)</u> billets on cooling bed. Cooling bed approximately 2 feet above walk way.	are pushed close together to form almost solid mass.
		Use 5' hook to pull chain sling around lift of billets. Billets black hot to dull red. Uses hook to pull chain under billets. Then hooks chain by hand. Man is close to pile of billets.	Exposed to heat from billets at dull red heat.
Open Hearth	2nd Helper	<u>Condition D</u> Make up tap hole.	Exposed to heat from steel and slag remaining from the previous heat.

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Open Hearth	Bottom Maker (Ladle)	<u>Condition D (continued)</u> Clean out ladles after teeming heat.	Exposed to heat from sidewalls of ladles which at times contain skull and generally have slag remaining.
	Hi-Mill	Use wrench to rotate tube 1/4 turn between passes through Hi-Mill. Stand close by bright red hot tube, partially bending over it during the element. Mill runs 4" through 8" pipe.	Close exposure to end of bright red hot tube.
Open Hearth	Platform Man	<u>Condition E</u> Cap ingots.	Exposed to radiated heat from top of ingots while capping ingots.

TABLE VII (continued)

ALLOWANCES FOR HEAT EXPOSURE

Bench Mark Elements of Work

Department	Job	Element	Condition
Soaking Pits	Bottom Maker	<p><u>Condition E (continued)</u></p> <p>Stand at edge of soaking pit and use long bar to break up coke for removal.</p>	Exposed to heat from open pit immediately after removal of last ingots at rolling temperature.
	Axle Maker	<p>Forge railroad car axles. Use special tongs to manually rotate forging to form axle. Works bending over one end of billet, at bright red forging temperature.</p>	Exposed to heat from forging very close to body and face. Axle roughed and finished on both ends without reheating.

is the time when the employee can perform no work, is not required by operations in progress to be attentive to the process, and may relax or await a signal. After a study has been made and it discloses that elements of required idle time are involved on the job, there are two steps which can be taken. The equipment, process, or routine of duties must be changed, or it might be possible to rearrange the jobs and redistribute the work loads in such manner as to eliminate the elements of required idle time. If one of these is not possible, then allowances must be included in the performance standards for the elements of required idle time.

It is felt that further explanation of these principles is unnecessary here. A more detailed account of the processes will be seen in Appendix G.

It is unusual for even the best operator to work with the easiest and least fatiguing movement. Often it is difficult to find out what is wrong with the motions, but once the change has been made, it seems so obvious that it is wondered why such had never been thought of before.

Motion study is too often thought of as a tremendously involved method of measurement which can be conducted only by large companies with ample facilities and capital. But it must be remembered that motion study is simply the analysis of a job with view of reducing it to its simplest accomplishments.

How often has the question been asked--"Which is the quickest way to so and so?" This is personal motion study; it is not a speeding up of the way as suggested by the opponents of motion study. The person asking the question will walk at the same pace regardless of the way he goes. However, he is saving time by eliminating unnecessary movement, which is the essence of motion study.¹

Gilbreth began his motion studies as early as 1885, but it was 1914 before too much progress was made. In 1914, Gilbreth was engaged in the contracting business and decided to make motion pictures of a bricklayer at work. By analysis of the motions of the bricklayer, he demonstrated that his output could be

¹C. L. Guest, op. cit., p. 77.

tremendously increased by giving more attention to the method of doing the job.

During the first World War, Gilbreth entered the industrial field and applied his motion study principles for the first time to mass production methods. This resulted in the application of scientific motion study gaining a strong foothold in industry.

The operations that workers perform may involve bending, stooping, lifting, pushing, pulling, or simply controlling levers on a machine by simple arm and finger movements. Most of these obvious motions really consist of a series of separate muscular motions that are not so easily seen. This has been observed by anybody who has watched a slow-motion picture.

The use of the motion picture camera is growing in importance to many companies. Modern cameras used in such work are so designed that actions photographed in the factory can be projected on a screen at any speed desired in relation to the original speed of the movements.

The high cost of motion study has been possibly the biggest stumbling block to widespread use of motion pictures for everyday work methods analysis. For certain

types of studies, a new technique called "memomotion" has been developed to overcome the handicap of cost. Memomotion pictures differ from the usual pictures in that they are taken at the rate of one per second instead of the usual 16 per second.

The one-per-second offers real economy. In the United States, ordinary film costs \$6.60 (£2 7s. 1½d.) per 100 feet, making pictures at 16 per second cost about \$1.65 (12s. 8 ¾d.) a minute. A one-minute memomotion record costs about \$0.11 (9 ¾d.).¹

Motion study today has not gained the foothold in Britain that it has in the United States, but it is being used more and more every day. The nearest British equivalent to the Gilbreths in America is Miss Anne G. Shaw, a former student of Dr. Lillian Gilbreth. Miss Shaw came to the limelight during her work at Metropolitan-Vickers in Manchester, England, where she made an effort to make every employee motion-economy minded. Apprentices coming into the company went through the motion

¹M. E. Mundel, "Memomotion Study Technique Simplifies Work Analysis," Factory Management and Maintenance, June, 1949, p. 85.

study school.¹

As a member of the Production Efficiency Board during the war, Miss Shaw gave assistance in training in various techniques of management, one being motion study. A course was conducted at Metropolitan-Vickers for men from different industries. Each man attending brought with him a job from his own company and used that as the basis for his practical work during the course. When he returned to the factory he established the new method on this job, studied other jobs, and taught other people how to do simple motion study work.²

Miss Shaw now has her own motion study laboratory at Beech House, Cheadle, Cheshire (England). The writer spent a very interesting day at her place, where he learned of the outstanding work being done. Her program for the teaching of motion study is most outstanding. Various companies send their own men to be trained in all aspects of motion study work.

¹A. G. Shaw, "Motion Study and Its Application," The Woman Engineer, September-October, 1935, p. 59.

²Anne G. Shaw, "Motion Study in Wartime," Occupational Psychology, October, 1947, p. 190.

Of interest in the field of motion and time study in Britain is the work being done by the Armed Forces. During the last war, a Motion Study Wing¹ was established at Donnington, England, and has made some noteworthy savings in manpower and equipment. The Wing works along three main paths--(1) the work in "services" such as ordnance depots, workshops, et cetera, (2) motion study applied to administrative functions, and (3) motion study on operation problems.

In the "services" category, motion studies have resulted in recommendations giving improved layouts and less fatiguing methods of work. Motion study has been applied mostly in depots, but some interesting studies have been made in operational problems. For example, at the request of the Engineer-in-Chief, methods of setting out and layout of minefields were examined. Previously it had taken eight men nine minutes and forty-eight seconds to set out a 100 yard panel, but the new method required five men only five minutes and five seconds. This result is not only of the greatest

¹"Motion and Time Study," issued by Motion Study Wing, Military Operational Research Unit, Donnington, England, February, 1947.

technical value, but it also decreases casualties when the job is done under fire.

At the request of the director of the Royal Artillery, the drill time of the 5.25 Coast Artillery gun was examined. As a result of the study, a rate of fire of eighteen rounds per minute was recorded, whereas the best previous record had been ten rounds per minute.

The Adjutant General of the United States Department of the Army has advised the writer that until the year 1947, the department was specifically barred from using any measurement of human endeavor. However, it is now engaged in an economy program in the utilization of manpower by eliminating unnecessary activities and duplication of effort, but as yet, the United States has no unit comparable to the British.

In the British scene, considerable significance is attached to the work being done in motion and time study in the building and civil engineering industries. Under the Ministry of Works, a field Test Unit is in operation at the Thatched Barn, Barnet, England.¹ Here

¹Rolt Hammond, "Management Techniques Cut Building Costs," Business, January, 1950, p. 80.

practical tests are carried out with prototypes of machines, devices and processes, which are tested under conditions which simulate "average" site conditions. Time and motion study is the basis of the work. It is expected that in the near future time and motion study methods will be applied to the wider aspects of housing.

Some studies from the American point of view indicate how time standards are established. A study made by the National Metal Trades Association¹ in 1928, shows that of 672 member shops, the base was established as follows:

43.3 percent by time study exclusively

30.8 percent by a combination of time study
and some other means

16.8 percent by past performance

8.5 percent by estimating.

A study made by the National Industrial Conference Board, in 1935,² covering 528 plants employing more than

¹"Methods of Wage Payment," by Committee on Industrial Relations, National Metal Trades Association, Chicago, 1928, p. 11.

²"Financial Incentives," National Industrial Conference Board Study #217, op. cit., p. 22.

half a million workers in the United States, found the methods of establishing performance standards to be as follows:

- 34.7 percent by average past experience
- 29.5 percent by careful analysis of past records
- 27.3 percent by simple time study analysis
- 40.3 percent by detailed time study analysis
- 19.1 percent by detailed time and motion study analysis.

Study No. 19, 1940, by the National Industrial Conference Board of 900 plants revealed that 24 percent used motion study as a formal part of operating policy. Of the 900 plants, 40 percent of those with 1,000 or more employees used motion study. This same study showed that 65 percent of the cooperating companies used time study in the establishment of standards.

The most recent survey available was made by Ralph M. Barnes. His study,¹ made in 1949, showed that 100 percent of the companies used time study; eight percent

¹Ralph M. Barnes, "Industrial Engineering--A Survey of Practices in 89 Plants," Factory Management and Maintenance, June, 1949, p. 90.

used past performance and seven percent estimated the standards.

There are cases where time studies are rarely necessary. For example, the Amalgamated Clothing Workers of America cooperate with management in setting rates. Both the union and the management representatives are so thoroughly familiar with rates and operations that time studies are hardly ever required. Experience has shown that it is very infrequent that rate setters in this arrangement disagree on rates.¹

The importance of accurate work measurement is receiving more and more attention. A Work Measurement Research Unit has recently been established in the Department of Engineering Production at the University of Birmingham (England) under Professor T. U. Matthew. The objective of the unit is, with the cooperation of individual firms and production engineers, to investigate existing standards of consistency and accuracy in time study rating practice between individual engineers,

¹S. T. Williams and Herbert Harris, Trends in Collective Bargaining (New York: The 20th Century Fund, 1945), p. 13.

firms and industries, and determine the allowances required for fatigue and other factors in various occupations and under different working conditions. The unit then hopes to establish methods of work content measurement in a more accurate and precise manner. Eventually it is hoped that a standard work unit can be defined so as to measure and compare the output and productivity of individuals, firms and industries.¹

Sir Graham Cunningham, in charge of the British dollar drive, recently referred to the prejudice of British workers toward time and motion studies. It is said that resistance to these studies has been the largest single cause of industrial disputes in Britain during the past 20 years.²

The Communist inspired strikes in Great Britain against the Bedaux system in 1931, were disastrous to work measurement. They did enough harm to measurement to set it back ten or twenty years, and it prejudiced

¹"Measuring Work Better," Business, March, 1950, p. 39.

²"Time and Motion Studies," Business, June, 1949, p. 230.

not only the working class but the management classes as well. They all assumed that there was something inherently wrong with the Bedaux system. Stop watches and the Bedaux system became synonymous and abhorred. This caused a prejudice that will take many years to eliminate.¹

In Britain, unions are beginning to train their own industrial engineers, as some American unions have done. The National Union of General and Municipal workers has done this already. In the Birmingham area the engineering group of the Transport and General Workers Union has given the plan some thought.

In America trade unions which have their own time study engineers include the textile, garment, steel, automobile, chemical, shoe and paper worker's unions. In many cases, management is hesitant to recognize the average union representative as being qualified to criticize the work of their personnel.

Today there is scarcely a type of industrial activity that someone has not already successfully

¹Gracie, op. cit., p. 19.

measured with reasonably promising results. If the existence of any job, task or function is justified, then it must have a purpose or objective. Better performance of this purpose, or closer attainment of this objective must be worth money to the employer. Therefore, it seems quite feasible that some yardstick could be devised to measure this better performance or closer attainment. However, the accuracy of work measurement by time study is in some cases quite questionable.

For several reasons, there are some jobs to which incentive plans are not usually applied. The work operations of indirect labor are often considered to be of too varied a nature to permit the establishment of accurate standards. In some cases, the cost of making adequate studies is out of proportion to the savings that might be made.

The desirability of placing testers and inspectors on incentive schemes is often debated. One objection is that if such personnel are paid on a basis that will affect their earnings, then quality of the finished product will suffer. However, it is felt that inspection work can be measured just as accurately by time study methods as can production jobs. Before attempting

to study any inspection work, the time study man must see that standards of quality are rigidly fixed by the chief inspector, and the time study engineer must understand exactly what is required of the inspector during the operation.

Study No. 91¹ of the National Industrial Conference Board shows some indication of the use of incentives to other than direct labor operations. The study covered 177 plants, and the results were as follows:

<u>Employee Groups</u>	<u>Percentage on Incentive Payment</u>
Materials handling	64.4
Shipping	61.0
Supervisors	45.0
Inspectors	45.0
Maintenance	27.0
Janitors and sweepers	24.3
Lubrication	18.6
Office and clerical	11.3
Others	15.8

Even though the bonus earnings are consistent enough to lead one to believe that they are quite accurate, the consistency is in many cases due largely to the workers. In most cases operatives know that they

¹Study No. 91, op. cit.

are expected to earn a certain bonus, and, consciously or unconsciously, they work at a rate which will approximate to it. One writer says, "I think we time study men have to be grateful for this. If they did not do it, I really think that we and our time standards would not show up so well."¹

The question of the number of time study engineers to employ is quite difficult. In fact, it depends almost entirely on the situation at hand. At the Bridge Company, there was one engineer to about 300 employees. On the other hand, at the Cambridge University Press, there are two time study men and six accessors in the compositors room. This means that eight men are required for only three hundred employees. The University Printer says, however, that he hopes eventually to reduce the accessors to three, leaving five men for 300 employees, or one for every sixty workers.

The 1940 study of the National Industrial Conference Board, already mentioned, found that of the 313 companies studied, 30 reported that they do not employ any full-

¹Abraham Cohen, Time Study and Common Sense (London: Macdonald and Evans, 1947).

time men as time study engineers. In five companies there were about 50 workers per time study engineer, and in 89 companies from 100 to 500 per engineer. In 143 companies the average was from 500 up to 860 workers for every engineer.

The 1949 study of Ralph M. Barnes¹ revealed that there was an average of 14 engineers for every thousand workers.

Some Other Problems

The task of installing a successful incentive plan is one of the most difficult and complex problems in the field of management. Before introducing the plan, every aspect of production tooling, layout, servicing, et cetera, should be improved to highest efficiency. "Before you introduce payment by results, make sure that you have attained 100 percent efficiency in production methods. Then if you desire to attain 105 percent

¹Factory Management and Maintenance, June, 1949, op. cit., p. 90.

efficiency, you may consider payment by results."¹

Since the establishment of a wage incentive plan is a highly technical job, one question which immediately confronts management is whether to entrust the project to qualified personnel within the company or whether to engage an experienced firm of outside consulting engineers to design a plan that will fit the need of the particular company.

Chances are that it will be difficult to find personnel within the plant with the necessary specialized training and experience, but members of the staff have the advantage of a knowledge of the company policies, and may be well acquainted with the employees. Since the cost of installation is a major consideration, a self-installed plan might be favored.

A study made by the National Industrial Conference Board in 1948, showed that of the 301 reporting companies, 32 percent indicated that their incentive plan was installed by a firm of consulting engineers. All

¹"Wage Incentive Schemes," British Institute of Management, op. cit., p. 1.

the remaining companies installed their own plans.¹

Perhaps the most important factor in the success of any method of payment is a clear understanding by employees and their confidence that the system is being fairly administered. If the employees of the company are represented by a recognized union, their representatives should be fully and continually informed as to methods and procedures used, and of the objective to be accomplished. Management and labor should be in entire agreement regarding the adoption or modification of the system.

Before the incentive plan was initiated at the Zenith Radio Corporation in Chicago, Illinois, the company was sure that the employees had been sold on the entire technique. Several months before the program was installed, the company undertook a comprehensive educational program to acquaint all personnel with the fundamentals of the plan, its operation and what was required of each worker to make it effective.

¹"Wage Payment Systems," National Industrial Conference Board Study No. 91, op. cit., p. 13.

Prior to giving notice to the employees, all management personnel were given complete information on the plan. This put supervisors in a position to answer anticipated questions.

To further promote understanding of the program among the workers, the company provided a time study training course for union stewards and for other selected individuals from the union membership. As a result, the union representatives helped to educate workers in the procedures and operation of the system. Furthermore, the union men were better prepared to handle grievances, because they were thoroughly acquainted with the plan and with the underlying techniques used in establishing standards and computing wage incentive payment.¹

Ample notice should be given to all workers in the plant. A sample notice giving details of the system to be installed is shown as Appendix H.

The program should be sufficiently simple to be

¹A. S. Pederson, "Efficiency Up to 20 to 60 Percent With Two-Stage Incentive Plan," Factory Management and Maintenance, April, 1949, p. 66.

thoroughly understood by those to whom it is applied. Workers should be able to calculate the effect of their efforts on their earnings. Some systems of payment lend themselves to easy calculation on the part of the worker. For instance, at the North British Rubber Company in Edinburgh, the standard minute value system is used. The worker knows the minute values for each job he does. To help him calculate his efficiency each day, he is given a small chart to use as a guide. A copy of this chart is shown as Figure 2. Since the worker knows his actual working time and his total minute value for the day, it is quite a simple matter for him to locate his efficiency for the day's work.

When incentive standards are installed, some unions stipulate that the rates be given a trial period before the final installation is made. For example, a contract between a United States metal products company and United Steelworkers of America--CIO, states: "The new rate shall be effective as of the date of installation and shall remain operative for such reasonable trial period as the company may fix, not to exceed six months from the time that such new rate was installed. Each

TIME AND BONUS SYSTEM

CHART OF ACTUAL WORKING TIME - TOTAL DAILY MINUTE VALUE AND EFFICIENCIES FOR WORKING PERIODS FROM FOUR TO ELEVEN HOURS

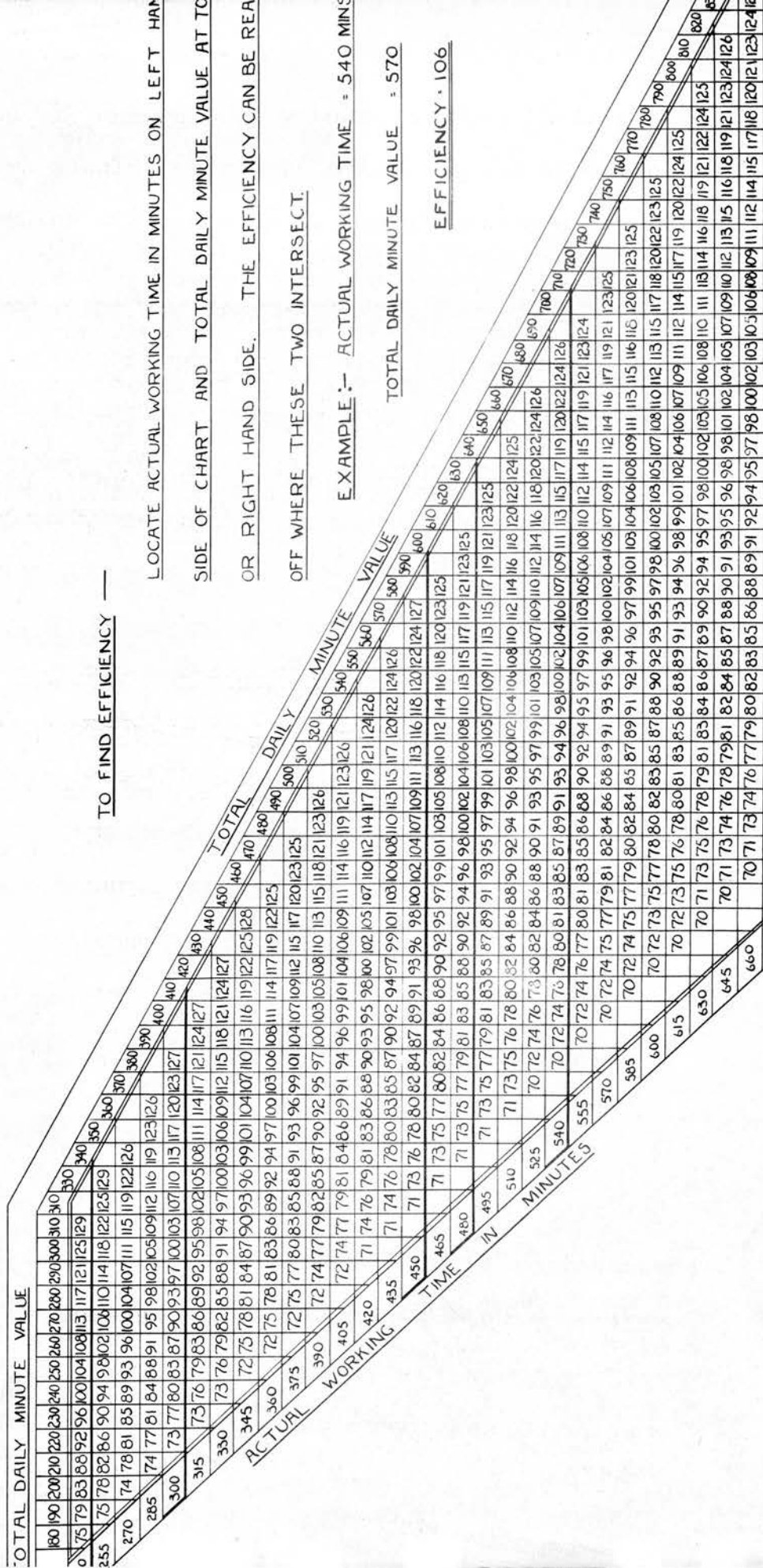


Figure 2

employee affected by the new rate shall be notified when the trial period is concluded. During such trial period, each employee shall make an honest and diligent effort to perform the work covered by such rate."

Once an incentive standard has been established, it should not be altered except by mutual agreement between the company and the representatives of its employees. If management alters the rate, then immediately it loses the confidence and cooperation of the workers. This is perhaps the main reason for much of the ill feeling toward incentive pay.

CHAPTER VII

PRESENT ATTITUDES TOWARD WAGE INCENTIVES

Attitudes of governments, unions, employers, and workpeople toward wage incentive plans change in the course of time from favor to disfavor, or vice versa, according to the situation at hand. Indications of these changing attitudes have been seen elsewhere in this dissertation. The present discussion concerns primarily the feelings as they exist today.

Never before the last World War had the United States government let its opinion toward wage incentives become so widely known as one of outspoken favor. The War Production Board was instrumental in seeing that incentive payment was used at every industrial installation where a suitable plan could be formulated. Chairman Krug of the WPB expressed the opinion in 1945, that the use of wage incentive plans was one of the most effective factors in making possible the tremendous increase in production during the earlier war years. Mr. Krug said, "I know of no technique of war production which has had greater simultaneous benefits upon munitions output and sound industrial relations than the fair,

just and well-engineered wage incentive plans. . . ."¹

As has been stated before, approximately one million workers were affected by new wage incentive plans in the year 1944, alone. Reports from management to the War Labor Board indicated that, on the average, there was an increase in production per man hour of about 40 percent. Thus, in the year 1944, the increase in productivity from new incentive plans resulted in the addition of an estimated equivalent of 400,000 persons to the working force of the country. The War Production Board concluded that "Incentives . . . are a time-tested way to get better results. They are traditional in the American system."²

Vice-Chairman Charles E. Wilson of the War Production Board advised American industry early in 1943, that wage incentives were the only general solution for the nation's combination production and manpower problem.³

¹"A Handbook on Wage Incentive Plans," op. cit., p. ii.

²Ibid., p. 1.

³"Wage Incentives in Wartime," booklet by Consolidated Management Consultants, New York, 1944, p. 4.

At the present moment in the United States, according to Mr. Ewan Clague of the Department of Labor, the official position of the government is that "methods of wage payment are matters to be determined by industry, or by industry and organized labor jointly."

During the past few years the British government has begun to turn to the old expedient of free enterprise to increase production. Even though, as we have seen, there are many obstacles that blunt the edge of incentive pay, more and more industries in Britain are turning to wage incentive methods. In fact, in Britain today it is becoming fashionable to advocate the payment of incentives in order to obtain higher output. Sir Stafford Cripps now emphasizes piece rates or incentive rates. Also, Mr. Attlee, Mr. Herbert Morrison, and other Government spokesmen, and even the General Council of the Trades Unions Congress have all gone on record as advocates of incentives. However, the T.U.C. would limit them to lower paid workers.¹

¹"The Fashion in Incentives," Business, January, 1950, p. 37.

To meet the growing demand for higher wages to offset the higher living costs resulting from devaluation, the British government has turned even more to advocating a system of wages tied to the rate of production.¹

Shortly after devaluation, the Trades Union Congress took a firm line against any immediate rise in wages to compensate for the rise in the cost of living that must follow devaluation. Thus, many firms who had never given a thought to wage incentive plans started asking for advice. Unfortunately, the Board of Trade by this time had wound up its Production Efficiency Service, which had helped with such services, but the Economic Information Unit at the Treasury Offices in London expressed that it would be willing to receive written applications for guidance until some other official body was created by the government.²

At the present time certain employer members of

¹"Britain Beginning to Favor Tying Wages to Productivity," The New York Times, November 7, 1949, p. 1.

²"Firms Seeking Advice on Bonus Plans," The Observer, November 13, 1949, p. 1.

Ministry of Labour George Isaac's Advisory Council for Industry are collecting information about successful incentive schemes which will be useful in encouraging other firms to adopt them.¹

The "wage freeze" was first put forward in early 1948. The government gave two reasons in the White Paper of February of that year. First, British costs must not rise relatively to costs in other countries, if she was to maintain and increase her share of world trade. And, second, the gap in the 1947 balance of payments could not be closed unless she devoted extra resources to this purpose instead of to consumption.

Such a wage freeze sounds reasonable in a way, but it takes for granted that the wage structure is sound and correct. But drastic changes are needed to bring the wage structure up to date. For example, in the engineering trades, the classification of operatives between craftsmen and other grades is appropriate to meet conditions of the nineteenth century, when it was first established, but is totally irrelevant to the kinds

¹"Incentives," The Time Study Engineer, May, 1950, p. 129.

of jobs which people now do on modern machines.¹

The Trades Union Congress has finally abandoned the policy of the "more rigorous restraint" adopted by a narrow margin at the conference in January. The congress has appealed to the "good sense and reasonableness" of individual unions, but has given up the attempt to formulate any kind of workable wages policy.² However, it was expected that the restraint should not last indefinitely. For example, Sir Stafford Cripps, speaking on the restraint of wages, said in his 1950 Budget address, "It is very understandable that that policy should have become difficult to carry through, and the longer the time that passes the more difficult it must become to apply it fully."³ He went on to say, ". . . it is vital to the continued success of our efforts that the policy of restraint should not be broken

¹W. Arthur Lewis, "A New Deal for Wages," The Observer, May 14, 1950, p. 4.

²"The TUC Gives Up," The Economist, July 1, 1950, p. 8.

³"Chancellor's Taxes and Concessions," The Scotsman, April 19, 1950, p. 8.

down either in the matter of wages, salaries, or profits until a better policy has been worked out to take its place."

Many of the leading industrialists in Britain have recently expressed their attitudes toward wage incentive plans. Mr. C. B. Colston, C.B.E., M.C., D.C.M., chairman of Hoover, Limited, in addressing the thirteenth annual general meeting on April 3, 1950, told the members that "We have developed various incentives and payment by results schemes. . . . These incentive schemes have involved the payment of considerable sums to our employees. They have been fully justified. They have helped to maintain the fine team spirit throughout our organizations and have greatly assisted our production and sales efficiency." Speaking of the wage freeze, he added, "We should not freeze industry with restrictions; we should stimulate it with incentives." Mr. Colston's conclusion was that "what is good for this company is good for the country as a whole."¹

¹"Company Notice--Hoover Limited," The Scotsman, March 13, 1950.

Another good example of British industrialist attitude is that of Lord McGowan, chairman of the Imperial Chemical Industries, Limited, suggested at a meeting of industrialists in Birmingham (England). Lord McGowan said, "What we need is not a wage structure guaranteeing a certain standard of living, but a wage policy of incentives and sanctions which will encourage the industrious and penalise the lazy. It is for that reason that I should like to see the increasing use, in every industry where it is possible, of work measurement and piece rates as a method of wage payment, a development which incidentally has already successfully gone some distance in my own company."¹

The basis for much of the worker's fear and suspicion of wage incentive plans is his objection to a purely "scientific" approach to his job. Workers claim that almost any job contains elements which cannot be evaluated by the quantitative stop-watch technique. For instance, they point out unpredictable variations in the quality of materials, in working equipment, and in other

¹"Lord McGowan in Favour of Incentives," Manchester (England) Guardian, November 11, 1949, p. 5.

conditions surrounding their jobs. They insist that the allowances for delay, fatigue and personal time are arbitrarily determined. And they realize that each of the job elements measured by the stop watch is evaluated by the time study engineer on the basis of his own judgment as to whether the worker being timed is a slow, average, or fast worker.

Workers feel that they are being treated as something abstract, rather than human beings at work. This feeling is accentuated when engineers break down jobs into repetitive operations, study work methods to discover short cuts and more efficient routines, shorten the cycle of operations which each worker is allowed to perform, and emphasize financial reward instead of creative workmanship as an incentive to efficient production.

The worker cannot understand how an engineer with no working experience on the job can have any first-hand familiarity with the jobs they are investigating. Such "scientific" study is looked upon with suspicion and distrust. This attitude is particularly stressed when an outside engineering firm is engaged to install an incentive plan.

Taking the selected industries upon which the field trips were concentrated, an attempt was made, either by personal interview or by correspondence, to get an official position of various unions toward wage incentive payment. In each case, the inquiry was made to the union or unions with the largest membership in their particular field.

As was expected, it was found that there is a wide divergence in opinion among the different unions. In the industries where piecework is the general and traditional method of payment, it seems that there is very little opposition. There are economic factors inherent in certain industries which make piecework a logical form of wage payment. An example is the apparel trades, where manual skill results in wide variation in individual productivity. It is in the apparel industries that there is the most complete acceptance of the principle of payment by results.¹ In such industries, payment by the piece is the only method that

¹Van Dusen Kennedy, "Union Policy and Incentive Wage Methods" (New York: Columbia University Press, 1945), p. 52.

many of the workers know, and the force of custom is very strong.

An example of this feeling was expressed by the General Secretary of the Amalgamated Weaver's Association in Great Britain. He stated to the writer that ". . . for more than a century, payment by results has been a cardinal feature of our activities. Generally speaking, neither employers nor operatives within this industry desire to depart from the principle of payment by results."

Major unions of the steel industries of both the United States and Britain seem to be in favor of incentive plans. An executive of a steel confederation in Britain states, ". . . incentive systems of payment . . . have worked very well over a long period of years and, indeed, have contributed to a considerable extent to the industrial peace which has existed in the industry."

The president of the United Steelworkers of America, a union with almost a million members, states, "Where morale is high and a good understanding exists between management and union members almost any wage

system can be made to work."¹

Another official of this same union made further comment to the writer about the position of the union. He says that the union has agreed to permit companies to install new incentive in operations where they did not previously exist, and has permitted revision of incentive standards when conditions change. He states further, ". . . we do not object to such where the plans are fairly devised and where they do not result in an inhuman speedup. Tonnage or incentive arrangements of one sort or another existed in the basic steel industry long before there was a union in the industry. The union accepted this arrangement when it acquired bargaining rights. In fact, such arrangements have been substantially extended by the companies during the period of the union's role as collective bargaining agent."

In the automobile industry, the fact is well known that in the United States the shift to day rates now covers most of the industry. When the United Automobile Workers of America gained widespread recognition

¹Cooke and Murray, op. cit., p. 112.

in 1937, the shift to hourly rates was greatly accelerated. One of the first demands of the union was for the abandonment of incentive wages. Since the output of many workers in the automobile industry is predetermined, the union does not generally accept payment by results.

In Great Britain, with the possible exception of the Ford Motor Company at Dagenham (England), it seems that the unions are still very much in favor of incentive payment. The General Secretary of a vehicle builders union in Britain said, "We are not at all opposed to payment by results until there is a surplus of workers. The system now works good, but if trade should break, there would be hostility regarding such payment."

The National Agreement between the United Kingdom Joint Wages Board of Employers for the Vehicle Building Industry, and the National Union of Vehicle Builders and the Amalgamated Society of Wood Cutting Machinists of Great Britain and Ireland, states:

Systems of Payment by Results may be introduced, or where piecework or other systems are in operation the same may continue, or where the employees on any particular class of work in any individual shop agree, the Employer shall not be debarred from arranging a system

of payment by results with the said employees, provided the details of such system or systems are mutually agreed, and the following conditions are observed:-

In all cases the time and overtime rates shall be guaranteed irrespective of earnings.

Mutual fixing and acceptance of all piece prices.

No piece masters to be allowed.

All wages or balances to be paid through the office to each man.

No debit balance to be carried forward beyond the weekly or monthly period of settlement.

It should be stated before proceeding further with the comment from various union representatives, that the opinions of officers of the international organizations in all cases do not necessarily reflect the attitudes and opinions of local unions and individual plants. In many cases it was found that the national office was very much in favor of payment by results, while in local situations there were differences ranging from bitter opposition to definite approval. However, it should be recognized that if the majority of the workers included in the national organization were opposed to incentive payment, then the union would also assume such an attitude. After all, the feelings of the national organization should reflect the feelings of the majority of its

members.

Also in many unions, the opinion changes entirely from time to time, as was seen in the discussion of the British engineering industry given in Chapter IV. Another example of such a change might be taken from the rubber industry in the United States. At the convention of the United Rubber Workers in September of 1940, the following resolution was passed:

Whereas: The industries of Detroit were the most vicious and prolific breeding grounds for incentive systems in the country, and Whereas: The toll of human lives and miseries heaped upon society by the Bedaux-Task and Bonus-Wage Bonus and other incentive systems is appalling, and Whereas: These incentive systems have been practically eliminated in Detroit through the efforts of the United Automobile Workers of America, Therefore Be It Resolved: That this convention go on record as opposing these systems and follow the example of the United Automobile Workers of America in eliminating this breeding of human misery in the United Rubber Workers of America.¹

Contrary to this resolution is a statement made to the writer by an official of the United Rubber Workers in June, 1950. He stated, "In most instances, where incentive systems have been in effect for a long period

¹Proceedings, September 16-21, 1940, p. 110.

of time, they seem to be accepted by the workers. To the degree that they provide a fair and decent wage level, they are also acceptable to the International." He stated further, "I should like to point out, in addition, that incentive systems are subject to many possible abuses on the part of managements or their supervisors. Our contracts, therefore, contain a number of provisions which indicate the types of payments that are to be made under specified conditions and which safeguard the rights of the workers from any arbitrary types of action. We, also, have our own time study engineers to check the decisions of management in case of disagreements."

The general secretary of the United Rubber Workers of Great Britain says simply, "Payment by results. Our union is in favour of it."

The printing industries in both countries have been quite hesitant in expressing favor toward payment by results. In Great Britain, compositors have been working on piece rates since 1785, but it was not until just recently that incentive pay has been generally recognized. For example, an executive of one national union in this trade stated to the writer, "For many years our

union was traditionally opposed to any form of payment by results, although it is true that a number of our London workers were engaged on piecework. However, in the interests of national economy, we have now modified our policy, and our people have been advised that the Executive Council are prepared to endorse payment by results systems, provided the bonus payment is assessed on the output of the department, and not of the individual. Up to the moment, very little progress has been made with the individual schemes." Incidentally, this union covers paper workers as well.

Of interest in the British printing industry is the already mentioned incentive plan at the Cambridge Press. The University Printer informed the writer that the concern worked very closely with the union while the plan was being installed. Because the system was the first to be adopted in an old-established printing industry, the union maintained a close check on its installation.

A letter from a major executive of the largest printing union in the United States states, "The attitude of the International Union toward incentive plans

is generally one of disfavor." However, as will be seen later, a small percentage of the workers in the printing industry are paid by some incentive method.

A Director of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers in the United States states that ". . . the sentiment among pulp and paper mill employees is overwhelmingly opposed to the use of incentive plans in the mills. Our organization has no official policy on the subject."

Unions embracing glass workers in both countries express an opinion of favoring wage incentive plans. A union in the United States, through its international secretary, states, "The union officials have always been in favor of such plans. In fact, one of the incentive plans in the industry was instigated at the union's insistence when the manufacturer felt he could not give a raise to the employees." This official's British counterpart also expressed a favorable opinion, saying that the workers had always worked on piece rate systems, and that a new agreement had just been completed to continue under such a system.

In the pottery industry, there are two major unions in the United States. Officials of both unions, the president in one case and vice-president in another, relay an attitude in favor of incentive pay. One of these officials stated, "Our organization has always fostered good incentive systems for workers in the plant. In this same vein, the General Secretary of the National Society of Pottery Workers in Great Britain says, "The Union has never objected to piece rates, but insists that any method of computing the rate shall be first approved by the Union Executive and facilities granted for inspection by officials of the Union at all stages."

The building industries in both countries have seen a change in attitude during the past few years. In Britain, agreement was reached in October, 1947, for the application of incentive payment for an experimental period of two years. The experiment was met with such success that the use of incentive payment in that industry is gaining favor as more plans are being

introduced.¹

The workers in the building trades are members of such a variety of unions that it is difficult to come to any conclusions as to a general attitude. In the States, however, union contracts in most of the building construction industry include provisions for prohibition of bonus systems and frequently of piece-work.²

A story was told recently in Washington by a Labor Advisor to the Economic Co-operation Administration. In a British works sixty men were employed as individuals on an operation for which a piece rate had been set. Ten of the men decided that they could do more work as a team, and by doing so they doubled their output and their earnings.

The company immediately asked the union for a cut of $12\frac{1}{2}$ percent in the rate. The two parties compromised and the rate was cut 10 percent.

¹"Incentives--Problems and Performance," The National Builder, July, 1949, p. 295.

²Harry A. Millis, "How Collective Bargaining Works" (New York: The 20th Century Fund, 1945).

The story was given, according to the official, as an example of one way in which the attitude of British industry on productivity differs from the American attitude. Rather than cutting the rate, he thought a mass meeting should have been arranged at the works, the ten men put up on a pedestal for what they had done, and the rest told to go and do likewise.¹

Many managements are afraid to try bonus schemes because they think workers may make as much as they need and then stay away. Not long ago a British worker was brought up before the absenteeism board in the factory to explain why he had not been at work on Saturday for the past three months.

"Why is it," the chairman asked him, "that you work five days of each week when the factory is open six?"

"Because I find that I can't get along on four days," the man replied.²

¹Cyril Dunn, "The Tale of Ten Men," The Sunday Observer, November 20, 1949, p. 4.

²James Reston, "British Worker Unexcited by Crises Over Currency," New York Times, September 4, 1949.

Foreign Secretary Bevin uses a striking phrase to define this character of the worker in Britain.

"There is in the island," he said, "a sort of poverty of desire; many workers prefer their leisure to the extra bit of cash."¹

In 1946, the National Association of Manufacturers (United States) appointed a committee on Employee Compensation to undertake a study² of opposition to wage incentives. The following discussion draws heavily on both the enumeration of the reasons for opposition and the answer of management to such objections.

Perhaps the strongest objection to wage incentives is the fear of unemployment. The workers think that the resulting increased productivity will make for fewer jobs, and so contribute to unemployment.

Management's basic solution to this problem is one of education. Workers must be taught that wage

¹Reston, op. cit.

²Information Bulletin No. 15, Industrial Relations Department, National Association of Manufacturers, New York, 1947, pp. 2-7.

incentives are one of the major factors that have encouraged increased individual effort, resulting in improved over-all plant efficiency which, in turn, lowers the cost of the product to the customer, thus creating a greater demand for the product, and thereby making more and more jobs available.

There is a fear that if total earnings are increased, incentive wages have a tendency over the long run to depress guaranteed hourly rates of pay, or at least to retard increases in hourly rates. This is very unlikely because of the growing practice of paying prevailing basic hourly rates in the community for comparable jobs. Competition for labor in local areas and smaller industries make it almost imperative that basic job rates be within the prevailing rate pattern.

Unions disagree with incentive systems because they require constant investigation and negotiation by union officials because of high frequency of grievances arising under such plans.

Most of these grievances are caused by lack of knowledge and call for more education. As management becomes more effective in the ability to measure and

define work accurately, wage incentive techniques become more effective, and more readily understandable and acceptable to all.

Another serious objection is the unfairness of delays caused by interrupted flow of work or breakdown of equipment, resulting from causes beyond the control of the worker. In this respect, management should extend guarantees to maintain earnings under certain circumstances.

The old objection to setting time standards or norms of production by guess, judgment, or past performance rather than through adequate study and analysis is gradually leaving the scene. Management has learned from experience that it is unsound and unwise to establish standards through any method other than a sound engineering basis. Industrialists know that inexact methods are more costly than exact ones.

In too many cases management fails to maintain plans which were originally well-designed, so that--through neglect--they no longer fulfill basic requirements. Proper maintenance of wage incentive plans is not only necessary to secure the confidence of workers,

but it is the only logical way to get the full returns in the way of low costs from the wage incentive scheme.

There are some craft unions which fear that wage incentive plans will destroy the craft and encourage excessive specialization. Their biggest complaint in this respect is that craftsmen will lose their bargaining power. Workmen must be taught that if the country is to maintain a tremendous production capacity and if they want to maintain a high standard of living, more production is the answer. These high standards are made possible to a large degree by the fact that a great number of jobs have been reduced to their elements in order to make the total operation more efficient.

Speaking strictly from the point of view of the employee, his main objection to wage incentive plans is that he is unable to understand the system. Management should realize the importance of keeping incentive pay plans as simple as possible so that all can understand them and compute their own earnings. The more complicated the system, the more opposition it arouses.

Cutting of rates is one of the main causes of disrepute of wage incentive systems. When workers try

to increase their production to secure the higher earnings made possible by the incentive system, some employers see their earnings become higher than those for similar or comparable work in the surrounding labor market and reduce the rates in order to make wages compare more favorably with the competitive level. Such action may result in a continual increase in required individual production, which is referred to by workers as "speed-up." Some complainants say that the speed-up results in pushing up output almost to the maximum of human endurance, without a substantial increase in earnings. According to one report made by the United States Bureau of Labor Statistics, management representatives in several different plants reported that production immediately rose 20 to 30 percent in their plants after management announced to the workers that there would be a guarantee of piece rates for the duration of the jobs on which they were set.¹

¹"Incentive Wage Plans and Collective Bargaining," United States Department of Labor, Bureau of Labor Statistics (Washington, D. C.: Government Printing Office, 1942), p. 5.

The question arises as to what constitutes rate cutting, and what is legitimate rate adjustment. Some managements say that when workers increase efficiency through their own skill they should enjoy the benefits, but when it is accomplished by eliminating definite elements from the operation, rates should be changed, because specifications have been altered. In practice, it is difficult in many cases to distinguish management contributions from those of labor.

"Speed-up" is the cause of many serious disturbances in industry even today. It is definitely not a thing of the past. For example, a wage incentive system was the principle issue in the recent strike by Local 401 of the United Electrical and Radio Workers Union against the Singer Sewing Machine Company in Elizabeth, New Jersey. This strike lasted four months and seriously damaged the economy of the city where Singer is the largest industry. The union called the wage system a "speed-up" and demanded its abolition.¹

¹"Wage Incentives," an editorial, New York Herald-Tribune, August 2, 1949, p. 14.

CHAPTER VIII

SOME COMMENT ON RESTRICTION OF OUTPUT

In the mid-war years, the United Electrical, Radio and Machine Workers of America, with a membership of 400,000 workers, placed page-long advertisements in newspapers throughout the United States, calling attention to the joint problem of incentive wages and restriction of output. One section of the advertisement stated, "We undertake, upon agreement from the given company and the union that the rate of production output per man hour as it existed prior to Pearl Harbor shall be deemed the Normal Output, that we shall put into action a union campaign to increase production output by 15 percent--and this increase shall be by the direct additional expenditure of energy and effort, over and above such increases as will be effected through improved methods or techniques instituted by our war production councils."¹

¹Advertisement in New York Times, March 25, 1942, p. 12.

The first assumption that comes to mind is that production must have been held 15 percent short of potential by the workers of the union up until this time.

When Mr. Donald M. Nelson, as Chairman of the War Production Board, advocated the use of wage incentive payment to labor as a means of speeding up war production, he stated that such a move would prove effective in doing away with "slowdowns" in war output.¹

A careful observation of almost any job will reveal that restriction of output in some form exists in practically every plant, on all kinds of jobs, and under all types of wage payment plans. The practice is so common that most experienced workers take it for granted. Any person with experience in the shop has undoubtedly heard a new worker ask, "How much is a day's work?" It is unusual to find a job on which the measure is "as much as you can do." There is almost always a definite amount of work against which the

¹"Nelson Opposes Ending Extra Pay and 40-Hour Week," New York Times, March 20, 1942, p. 1.

worker can measure himself. When workers ask the question, "How much shall we do today?" the answer depends on the worker's decision. They think it only natural that they should put forth the effort which they believe to be best for their well-being, both as individuals and groups, best for their mental and physical health, best for their standard of living, and best for their security.

Restrictive measures, still too common, interfere with full production; and the workers, and those who speak for them--their trade unions, have still to learn that what may appear to be a temporary advantage to any classification of industry, in so far as it impairs output and the freest possible use of its productive powers, will inevitably react on the standard of living of the nation as a whole and, therefore, of the workers themselves.¹

The writer does not contend that all workers restrict their output, but it is definitely one of the major problems of industry. And it seems that limitations are much more strictly practiced on jobs where payment by results is used than on jobs paid by day work.

¹"Britain Prospects," an editorial, Journal of the Edinburgh Chamber of Commerce and Manufactures, Vol. XXX, No. 3, February-March, 1949.

According to Britain's G. D. H. Cole, there are at least four ways in which collective "restriction of output" can take place:¹

(1) The first restriction may be definitely imposed by the rules of the union. For example, there might be a definite prohibition of piecework and other types of payment by results.

(2) The restriction might be imposed by a local bye-law of a trade union rather than by rule. Many unions have detailed regulations governing the operation of payment by results in particular districts, or regulating overtime or the class of worker to be employed on a given machine.

(3) The restriction might be in the form of a collective agreement between the employees and the company. For instance, during a visit to a British coal mine, the writer found that each day the miners were given a certain tonnage to dig from the seams, and when that was completed, their day's work was done.

¹G. D. H. Cole, "The Payment of Wages" (London: George Allen and Unwin Limited, 1928).

(4) The restriction might be an unwritten custom of a workshop, district or trade. It is not expressly stated, but is usually adhered to by all the workers. Some examples of this might be the restriction of entry of workmen to the trade, restriction on the employment of non-union labor or of workers not belonging to the particular union which has made the restriction.

The subject of restriction of output is important to this discussion since it concerns the withholding of efficiency by the worker. When a time standard is set for the purpose of payment by results, we are interested in obtaining a fair day's work from the worker before he is eligible for incentive pay. With the prevalence of restrictions on output, our objective is completely lost.

Certain restrictions become so customary to the worker that the restrictive pace comes natural to him. However, in all cases there is no proof that all workers are restricting their output. Rather than this, in many cases the pace of extremely fast workers is held in check in order that the average or slow workers can obtain normal production without over-exertion.

Such limitations are, in a way, harmful to the worker who could work faster were it not for the restriction.

"The limitation of busyness raised to an art and repeated until it becomes habit grinds attitudes into men's characters which are bad for society and bad for industry. To live under hourly frustration of the decent tendency to do a reasonable amount of worthwhile work is continually to lose self-respect; and self-respect is the unit value of an organized society."¹

The fear of unemployment holds the most important influence on the minds of workers in both Great Britain and the United States. There is no doubt that restrictive traditions were born largely from painful memories of the pre-war depression years. The Hawthorne experiments showed that the depression and fear of layoff occupied an increasingly important place in the thoughts of the workers. In interviews and in everyday conversations with one another the workers speculated endlessly upon when the depression would end, whether they would be laid off, and what would happen to them if

¹Stanley B. Mathewson, "Restriction of Output Among Unorganized Workers" (New York: The Viking Press, 1931), p. 184.

they were laid off.¹ The employee is actually protecting his economic interest by restricting his output. He argues that if such practices are not used the less capable worker will be reprimanded and discharged, or some of his co-workers will be laid off. Too, if he does not restrict his output at some level his piece rate will be cut.

There are cases where the term restriction is used to reflect nothing more than the failure of an incentive plan to bring forth the additional production predicted or expected from the workers. Estimates can be made as to the amount of restriction that takes place in various companies, but the accuracy of such statements is doubted. A textile union official remarked that he never knew of a textile worker who would not say that he was being overworked, and yet he could show anybody mills where 40 percent of the worker's time is idle. He stressed that the notions of workers about the rightness of their jobs become very strongly

¹F. J. Roethlisberger and W. J. Dickson, "Management and the Worker" (Cambridge, Massachusetts: The Harvard Press, 1939), p. 531.

established. "If a man is led to believe that his job is to walk across a room once an hour, he will think he is overworked if he is told to walk it twice."¹

Mr. Charles S. Slocombe, editor of Personnel Journal, has stated that worker restriction of output, considering both organized and unorganized workers is about 25 percent in normal times.²

A revealing article written by a worker with 20 years experience in American industry shows that during that period he has seen his salary rise over 75 percent, while his production has fallen 25 percent. The writing goes into some detail telling of restrictive practices among the workers. His final conclusion is, "Sure, I could produce more."³

Mr. L. Urwick of Britain says that "Not one worker in a thousand is free from a pervasive and

¹Kennedy, Van Dusen, op. cit., p. 108.

²Charles S. Slocombe, "Union Participation in Defense," Personnel Journal, January, 1942, p. 257.

³Carlton Bradshaw, "Sure, I Could Produce More," Harper's Magazine, May, 1947, p. 396.

persistent tendency to restrict his or her output to a level which is only a fraction of the optimum, a tendency which in the majority of instances is unconscious."¹

In 1947, the Economist stated that it would be impossible to separate output restriction caused by the worker's fear of unemployment from that due to other causes, but went on to add that an increase in total output achieved in the United States from the cessation of all restrictive practices from workers would be between 25 and 50 percent.²

A practice among workers which is related to restriction is the custom of maintaining a backlog of completed work that is not turned in on the day it is produced. In this way the worker keeps a reserve of several hours work, accumulated during a stretch of easy or rush work, which he can use if a slack period should arise. The writer has on several occasions found work under the bench or in the worker's locker. Another practice, where the units of production are

¹L. Urwick, "The Will to Work," 19th Century January, 1949, p. 12.

²Lynton, op. cit., p. 65.

large, is to practically finish the piece of work, but leave little enough undone that the unit can not be considered as a finished product.

One writer¹ calls attention to penalties imposed by unions for serious infractions against restrictive practices. The system referred to is an arrangement called the "kitty" system. A limit on production or earnings for a certain period is agreed upon, and workers forfeit any amount earned over that limit. This amount goes into a common fund or "kitty" and is spent periodically for a group function or celebration.

Perhaps the most careful study of restriction of output and its related factors is that made at the Hawthorne Works of the Western Electric Company. An example of the findings of the Bank Wiring Observation Room which worked on a group piecework system is cited here in some detail.²

In interviews with the operators in the department before the study began, the investigators encountered certain beliefs which the employees seemed to hold in common. Chief among

¹Kennedy, Van Dusen, op. cit., p. 118.

²Roethlisberger and Dickson, op. cit., pp. 412-429.

these was the concept of a day's work. This idea kept cropping up in interview after interview. Of the thirty-two men interviewed in the department before the study began, a group which included the nine wiremen later selected for the study, twenty-two discussed rates of output. Of these twenty-two, twenty said that the wiring of two equipments constituted a day's work. The other two men said they were supposed to try to make the bogey (the output standard in terms of which an individual's efficiency could be measured), which they correctly stated as 914 connections per hour.

From comments such as these it was apparent that the operators were accustomed to thinking of two equipments a day as a day's work. This was verified by the observer, who found that the operators frequently stopped wiring when they had finished their quotas even though it was not officially stopping time. This concept of a day's work was of interest for two reasons. In the first place, it did not refer to the bogey or any other standard of performance officially imposed.

In the second place, the idea of a day's work was of interest because it was contrary to one of the basic notions of the incentive plan. Theoretically, the incentive plan was intended to obviate the problems attendant upon the determination of a day's work.

As the study progressed, it became more and more apparent that the operator's concept of a day's work had a much wider significance than has thus far been implied. The interviewer, while inquiring further into this belief, found that it was related to other beliefs which the operators held quite generally. These other beliefs, which incidentally are quite common and more or less familiar to everyone, usually took the form: 'If we exceed our day's work by any

appreciable amount, something will happen. The rate might be cut, the rate might be raised, the bogey might be raised, someone might be laid off, or the supervisor might bawl out the slower men.' Any or all of these consequences might follow. This statement represents the summation of a variety of employee's remarks in which these fears were more or less implied.

Statements like these indicate that many apprehensions and fears centered around the concept of a day's work. They suggested that the day's work might be something more than an output standard, that it might be a norm of conduct. . . . The observer . . . found that men who persisted in exceeding the group standard of a day's work were looked upon with disfavor. This was manifested in subtle forms of sarcasm and ridicule.

W6 and W2 were the first in output and it was toward them that most of the group pressure was directed. W6 was designated by such terms as 'skimp,' 'runt' and 'slave.' Sometimes he was called 'Speed King.' W2 was called 'Phar Lap,' the name of a race horse.

An idea frequently expressed, directly or indirectly, by the employees in the interviews was that their weekly average hourly output should show little change from week to week. This does not mean that all of them should try to achieve identical average hourly outputs each week. It did mean that each of them should try to be fairly consistent week after week irrespective of differences in the absolute levels of their outputs. Their reasons for this were similar to those they advanced for not exceeding their day's work. They felt that if their output showed much change either from day to day or from week to week 'something might happen.' An unusually high output

might thenceforward become the standard their supervisors would expect them to maintain. The men felt it would be a way of confessing that they were capable of doing better. On the other hand, they felt that a low output would afford their supervisors an opportunity to 'bawl them out.' If output were kept fairly constant, they thought, neither possibility could happen.

In their interviews some of the employees remarked that they sometimes 'saved up connections' on days when their output was high and reported them on days when their output was low. They said that having some work saved up made them feel better.

The department permitted employees to claim daywork for unusual stoppages which were beyond their control. It did not, however, define what an unusual stoppage was or attempt to state which stoppages were and which were not beyond the employee's control. . . . Some of them claimed more daywork allowances than they were entitled to or contrived to bring about occurrences which would justify their claims. The interesting thing about these claims is that they meant nothing to the operators in terms of payment. The operators were here addressing themselves not to financial gain but to the security they felt came from uniform output curves. They say, of course, that the more daywork they were allowed, the less output they would have to produce in order to maintain a given output rate.

Many of the restrictions are hard to spot in some cases, but almost anyone with factory experience knows full well that they exist.

Some unions stipulate a minimum amount of work which an employee must do in a certain length of time, but this minimum becomes the limit on production, since no worker is required to produce more than the limit in order to hold his job.

In the 1920's the Chicago Linotype Operators' Society published a union paper called "The Hot Slug," in which appeared such items as the following:

MR. OPERATOR

When you sit down to the linotype to begin your day's work, do you remember that you are a union man? Do you remember that the union has established a deadline--the amount of type that is a fair day's work? Do you realize that when you produce a much larger amount than the deadline you are forcing some brother member to walk the streets who should be receiving pay for doing the work that you are doing for nothing?¹

All unions do not come out so bluntly and stipulate the restriction, but they exist just the same. For example, the "stint" in the bricklaying industry of our time is something like 375 bricks per day. Frank B. Gilbreth secured more than three times that figure at the beginning of the century without undue

¹Slichter, op. cit., p. 170.

driving or fatigue.¹

The restriction of output does not necessarily denote worker inefficiency, nor does it signify poor management. Some writers try to misinterpret restriction by the worker on the ground that he is deliberately and willfully opposing management. However, the Hawthorne investigations found nothing in the behavior of the group that even faintly resembled conscious, planned opposition to management.² During the investigations in 1929, there were 40,000 complaints voiced, and not one comment expressed disfavor toward the company in general.

Some evidence obtained during the experiments at the Western Electric Company suggested that the wage incentive systems under which part of the employees worked had become ineffectual by group pressure to restrict output. Informal practices by means of which some of the operators were put under pressure and kept in line were brought to light. It seems that some of the operators took upon themselves the responsibility of seeing that all members of the group co-operated and protected themselves

¹Urwick, op. cit., p. 13.

²Roethlisberger and Dickson, op. cit., p. 535.

from interference of other groups within the company.¹

A good example of restrictive practices among workers in Britain resulted in wide publicity early last year. The incident was so cleverly reported in the Scotsman² that it is being given in full here:

Briefly put, the community may now be broadly grouped into a twofold classification--the working classes and the overworked classes. The idle rich, that enviable band of pleasure-seekers whose existence proved of priceless value to the propagandist, have virtually faded from the landscape. They have gone and left a gap, but since nature abhors a vacuum the space they left must be filled.

Who is to have the honor of filling the breach? It looks as if a suitable candidate has been found--a man who works too hard. A foundryman called Donald Cooper has had to leave his job near Newcastle because his mates made a butt of him for producing 30 to 40 percent more a day than they did. Mr. Cooper didn't make any more money; he was paid at the same flat rate as the others, but he seems to have suffered from a perverted sense of patriotism which caused him honestly to believe that the road to national prosperity meant hard work. In Russia they call workmen who reach sensational output targets Stakhanovites and they are paid more and are treated with great respect. The British working man who in the past has been a warm admirer of Soviet Russia apparently has no use for the Stakhanovites.

¹Roethlisberger and Dickson, op. cit., p. 380.

²"A Laughing Matter," Scotsman, May 18, 1949, p. 6.

We shall have to coin a name for this new type of dastardly working man who takes it upon himself to increase production. A "Cooperite" would be as good a name as any. The sign of the "Cooperite" is disregard for economic incentives and an inflated sense of personal responsibility. We must weed him out.

Mr. Donald Cooper is in danger of becoming a marked man. If he perseveres in his foolish conduct he will become an outlaw, a social outcast, a working man who believes in work. We shall have to pass legislation to make conduct such as his illegal. No self-respecting Trade Unionist will consent to toil alongside a fellow who is determined to work at his maximum effort.

From the worker's point of view, the boarding house conversation given below seems to pretty well cover the whole subject of restriction of output as it is related to methods of payment.¹

Walter, at the head of the table, was a leader in a group of about fifteen men at the boarding-house. Walter had native wit and a positive way of talking. He assembled automobiles at Plant X. Henry, who sat at his right, was a youngster on assembly work in Plant Y. Mat was the investigator who reported the conversation. He and Henry were exchanging information about their earnings. When Mat states that he earned 80 cents an hour as a bench assembler at Plant Z, Henry rather proudly announced that he was earning 85 cents an hour. Walter cut into the conversation to say to Henry, 'Whenever you earn

¹Mathewson, op. cit., p. 65.

more than 75 cents an hour working for that outfit you are in danger.'

'In danger of what?' Mat demanded.

'Getting your rate cut. Don't let 'em fool you. I know. I've worked for X Company. I was framing boxes with a buddie, and they kept cutting the rate until we had to frame one every 15 minutes and go after our own stock. If we stopped for a drink of water, we got behind. Some fresh guys came in and killed the job. Believe me, nothing like that happens in the bunch where I'm working now. If anybody, new or old, starts to 'put out,' the whole bunch bumps him. We are turning out four cars a day and earning 90 cents an hour. We could earn \$2.50 an hour if we 'put out,' but, as it is, our job's one of the best in this town, and we made it so by holding it down.'

'Just how do you hold it down?' Mat wanted to know.

'Yesterday they got in a hurry for a job and we put out four and a half cars,' Walter explained. 'That was \$1.12 an hour, but we got a promise from the boss, first, that he would protect us.'

'From the foreman or general foreman?'

'There isn't but one and he will keep his promise.'

'There is a fellow where I work who is a whole day ahead,' Mat stated. 'He's got tomorrow's work already stored away under his bench.'

'He's a fool,' said Walter. 'He'll get caught at it and all of you will have to work harder for the same money. You should never get more than an hour ahead--any more is dangerous.'

'Our group works together and we help each other out,' said Henry. 'We are ahead.'

'Then you are fixing to get a rate-cut, too,' was Walter's prompt warning. He turned to the group. 'When a worker can go into these plants and earn \$35 to \$40 a week, he better be satisfied. It used to be that you could earn that much and not work yourself to death; but look what they done to me out where Henry works. The hogs kept coming in and tearing loose at the job until out there now, and most everywhere in town, you got to go like blazes to make out. The only way to protect yourself is never to let the boss find out what you can put out.'

'I think I got gypped on my pay last week,' Mat complained.

'I don't like the outfit you work for,' Walter commented. 'They'll gyp you every week. And, boy, when they ring in that 'efficiency' business you are sunk. When I worked there, we never knew what we earned until we got our checks. A working man is entitled to know just where he stands every day. He's got to protect himself. Believe me, we know every minute where I work now just where we stand--we are going to put out four cars a day and no more.'

CHAPTER IX

SOME COMPARISONS OF METHODS OF PAYMENT IN
SELECTED INDUSTRIES IN GREAT BRITAIN
AND THE UNITED STATES

During the two years of research, the writer was able to visit many outstanding industrial organizations in both Great Britain and the United States. The visits were in most cases confined to industries discussed in this chapter. Even though the number of calls made in one or two of the industries could be considered as representative samples, the percentages of workers found to be under some method of incentive payment are not given as definite conditions of the industry as a whole, but the figures are felt to be indicative of the actual situation. Along with the findings based on the visits, references are made to studies made by governmental and other organizations in the two countries. In many cases the author's findings compare quite favorably with the findings of other studies.

As is true in other portions of the dissertation, names of companies and individuals are omitted except

where permission was given for such names to be used.

Some discrepancies could possibly exist in the information used in the discussion because of the fact that many visits were made as long ago as two years, and changes could have been made during the lapse of time.

Table VIII will give an idea as to the use of incentive payment in the industries to be discussed. It will be noticed that no percentages are given, but the extent of use of wage incentives is given under the headings of slight, moderate, substantial, and general.

Automobiles

The automobile industry is often and quite properly cited as the classic example of mass production. A goodly portion of the work in the industry is paced by the speed of the assembly line. Even work not done directly on the conveyor belt must be rather closely geared to the output of the line.

In the United States, various types of group piece rates were in common use in the automobile industry during the early twenties. Such rates have long been

TABLE VIII

INDICATION OF PREVALENCE OF INCENTIVE PAYMENT
AMONG DIRECT WORKERS IN SELECTED INDUSTRIES
OF GREAT BRITAIN AND THE UNITED STATES

<u>Slight</u>		<u>Moderate</u>	<u>Substantial</u>	<u>General</u>
<u>Great Britain</u>				
Building	Coal		Automobiles	Pottery
Printing	Flat Glass		Glass Containers	
Paper and			Rubber	
Pulp			Shipbuilding	
			Textiles	
			Steel and Iron	
<u>United States</u>				
Building	Automobiles	Flat Glass	Glass Con-	
Printing	Coal	Steel and Iron	tainers	
	Shipbuilding	Textiles	Pottery	
	Paper and Pulp		Rubber	

abandoned by all but a very few companies. Workers generally disliked group plans because of the difficulty of determining the wage, and because individual effort had little bearing upon the wage. One of the major objections was that in many cases a group, instead of being kept small, included up to one thousand men.¹

During the early 1930's, group piece rates were superseded by some form of individual piece rate. The later plan was in operation until about 1934 in the motor vehicle plants, and until 1936 in the parts plants.²

The change to straight hourly rates was made at the specific request of the workers.³ Employee dissatisfaction in the industry was partly responsible for the growing interest in unionism. Thus the unions were largely responsible for the introduction of the hourly rate, even at plants where unions were not recognized.

¹C. B. Gorby, "Measured Day Work Replaces Incentives in the Automobile Assembly Industry," The Society for Advancement of Management, November, 1936, p. 164.

²W. M. McPherson, "Labor Relations in the Automobile Industry" (Washington, D. C.: The Brookings Institute, 1940), p. 94.

³"Measured Day Work Replaces Incentives in the Automobile Assembly Industry," op. cit., p. 163.

The shift to hourly rates was greatly accelerated when the United Automobile Workers gained widespread power in 1937. One of the very first major demands made by the new union was for the abandonment of incentive wages.¹

Piecework was found still to be the predominant method of payment in many plants outside the Detroit area, and is still used to some extent in most plants. One of the larger motor vehicle companies reported that about 35 percent of its employees are now on piecework, while before union recognition in the late 1930's, 65 percent were on such plans.

One writer² states that methods of wage payment have affected production diversely. Some uniformity lies in the fact that nearly all plants changing from piece to hourly rates experienced a drop in output soon after. Many plants eventually got their production back to standard, while others find it difficult to average 90 percent of standard.

¹ Millis, op. cit., p. 611.

² Ibid., p. 612.

General Motors Corporation, the world's largest automobile manufacturing concern, made a demand at the 1943 Convention of the United Automobile Workers that the union withdraw its opposition and give its support to incentive methods of pay in corporation plants where such methods would be appropriate. However, the vote proved a clear victory for the policy of opposition. On April 1, 1943, a special committee was created to adopt minimum requirements for approved wage incentive plans. The requirements did not forbid local union action in acceptance of incentive payment systems, but required prior approval by local membership and by the International Union. Mr. W. H. Frater, Director of the Wage Analysis and Control Section of General Motors Corporation, informed the writer that with minor exception all the company plants now pay their workmen on a day rate basis. In a few cases incentive wage payment systems are still in use in plants where custom carrying over from previous times dictates the retention of such systems of payment.

A study made by the National Industrial Conference Board in 1947,¹ showed that 59.8 percent of the 92 automobile plants studied used some incentive plan for at least a portion of their productive workers. This does not mean that the percentage of workers on such plans is nearly this impressive. The United States Department of Labor reports that at the present time less than one-fifth of the workers in the motor vehicle industry are paid on an incentive basis.

In Great Britain, payment by results is widely used in the automobile industry. During visits to some plants, it was found that the number of direct workers on incentive pay approached 100 percent. For example, Mr. Lyons of the Austin Motor Company, Limited, at Longbridge, Birmingham (England), with about 17,500 employees, stated that virtually all direct workers were on piecework. Wherever possible, individual piecework is used, but in many cases gang piecework is employed. For indirect workers, some method of payment by results is used on every possible job.

¹National Industrial Conference Board Study No. 86, op. cit.

Visits were made to vehicle manufacturers employing almost 20 percent of the total employment of the industry, and it was found that about 85 percent of the direct workers were paid by some incentive method. Two large companies reported that as many as 95 percent of all workers were on piecework. However, these figures are not representative of the industry in Britain. The Ford plant at Dagenham (England) has followed the policy of the companies of the United States, and at the present uses a straight time rate.

The piece rates of all plans studied were required by the union agreement to be such that would enable a worker of average ability to earn at least $27\frac{1}{2}$ percent over the base rate. Of course, this is not a definite percentage required by all unions in the automobile industry of Britain. The agreement between the Standard Motor Company Limited and the Confederation of Shipbuilding and Engineering Unions stipulates that "Bonus times for new work shall be such as to enable not less than 50 percent bonus on new rates to be earned." And the agreements of the National Union of Vehicle Builders state that "Piecework prices and bonus or basis time shall

be such as will enable a workman of average ability to earn at least 33-1/3 percent over present time rates (excluding war bonuses)."

The Standard Motor Company agreement mentioned above has some other interesting features which are worth mentioning. Unlike the endeavor in some of the other automobile companies to employ individual rates wherever possible, this company is bound by the union contract to operate the bonus scheme on a gang principle. The contract stresses that for this purpose "the entire works shall be divided into as large gangs as possible." As many of the indirect workers as possible, whose efforts are closely connected with those of a particular gang of direct workers, are considered a part of the gang.

The payrolls in the British automobile industry, as in some others, are sometimes quite a complicated affair. In calculating the amount of money to pay a worker all the following items must be included: Base rate plus Merit Pay plus Compensatory War Award plus National Award. The amounts are war-time additions used to evade the "wage freeze." Merit pay is really

a misnomer in this case. Rather than an additional amount based on the merit of the worker, it is a leveling factor which is fixed within a grade of workers. All workers in that grade receive the same amount. The Compensatory War Award and the National Award are actually cost-of-living additions made by a special tribunal during the war years. None of the additions have a definite incentive effect on the productivity of the individual worker.

The latest figures compiled by the Ministry of Labour show that 56 percent of all workers employed in the manufacture of motor vehicles were paid at piece rates. This same report indicates that 59 percent of workers engaged in the manufacture of parts and accessories for motor vehicles and aircraft were paid by piece rates.¹

Building Industry

One of the most interesting industries studied was the building industry, this being so primarily because

¹"Proportion of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

of the growing interest in incentive payment in Great Britain. The building industry in the United States is outstanding for the almost complete absence of incentive wage systems. In fact, most union contracts include provisions for the prohibition of bonus systems and time and motion studies.

Little effort has been made in the States to introduce methods and practices of "scientific management." The complex nature of building operations does not permit the ready introduction of methods used in housed businesses. Many union rules stand in the way of any improvement in this direction.

The discussion here considers only the building workers who are engaged in outdoor construction jobs. For such workers, the rates of pay are generally based on the assumption that only about forty weeks of work are available during the year. Because of the intermittent and seasonal character of employment, building trade unions have great incentive to restrict output.

In the States it seems that one of the main reasons for opposing piecework is the fear of undermining the standard rates, which are among the highest

paid to any class of workers. For example, the average hourly pay of a building construction worker in March, 1950, was \$2.01 (14s. 3-1/4d.). This can be compared with an average of \$1.60 (11s. 5d.) in the metal industries, \$1.53 (10s. 11-1/2d.) in the rubber industry, \$1.21 (8s. 7-3/4d.) in the textile industry, \$1.39 (9s. 11-1/4d.) in the stone, clay and glass industry, and \$1.87 (13s. 4-1/2d.) in the printing industry.¹

Some trades have permitted piecework under proper precautions. Lathers' unions in some cities allow piecework. Too, the paper hanger can work under piece rates.

An Anglo-American Productivity team was sent to study American building methods in 1949, and their conclusions² were that while wages of American builders were four times as high as in Britain and building costs were 55 to 80 percent higher, production per man hour was 50 percent greater. Even though the team found mechanized equipment used more extensively in the States,

¹Table C-1, Monthly Labor Review, June, 1950, pp. 687-701.

²"Productivity Team Report: Building," Anglo-American Council on Productivity, London, 1949.

it did not attribute the higher productivity to this factor. Since the American industry does not use payment by results, the question is asked, "What, then, accounts for the difference?"

The difference, at least to some extent, is explained by a comparison of social conditions in the two countries. The report enumerates some of the differences. It states that a worker might start the day fresher if he has driven to work by car, instead of having to travel by bus or train. High quality food is plentiful for the mid-day packed meal, and in many cases mobile canteens are brought to the building site. But, the report states, the greatest difference can be explained by "the individual attitude towards work." In America the building worker has never acquired the habit of doing less than he is capable of doing. A job in the building trades offers the worker a high standard of living, and back of this lies the threat of unemployment and "the considerably greater difference between average earnings and unemployment benefit."

The system of payment by results in the British building industry would not create the conditions that

exist in America, but it will seek to replace them by a different incentive.¹

In Great Britain the building unions have in the past set their faces against piecework and payment by results of any kind. Attempts to introduce such schemes have been made by employers since the 1860's.² Between the wars, very little piecework was used except on unorganized and "jerry-built" jobs, and in such cases, bonuses were fixed in a very rough way.

Prior to 1939, the Working Rule Agreement of the building industry made no provision for the application of a payment by results system, and some local rules of Northumberland and Durham, of the Manchester area, and in Scotland, expressly prohibited such schemes. Some unofficial incentives to increased output were known to be in operation, but they were not necessarily related to measured output.³

¹"The Nature of Incentives," The Economist, May 6, 1950, p. 1023.

²Margot Heineman, "Wages Front" (Pamphlet), 1947.

³"Payment by Results in Building and Civil Engineering During War," London, His Majesty's Stationery Office, 1947, p. 1.

During the early months of the war, work on the extensive building program of the Government proceeded almost entirely on a time rate basis. However, in the spring of 1941, it was decided that the program was not proceeding as rapidly as the military situation demanded. As a result of the situation, the Government indicated its intention to introduce a system of payment by results, related to measurable quantities of work and applied to all projects regarded as essential to war work.

The scheme was based on a fixed target, production above which was paid a bonus representing two-thirds of the saving in labor cost resulting from any increase in output above the target. Basic output rates or targets for the various operations in the building industry were published for reference by contractors and operatives.¹ For example, the basic output rate for hand excavation in trenches up to three feet six inches deep was 0.5 cubic yards per man hour, meaning that the target for

¹"Memorandum on Payment by Results," Third Edition, London, His Majesty's Stationery Office, 1944.

excavating one cubic yard was two hours. On such an assignment, if the two hour target could be completed in one and a half hours, the worker was entitled to his normal wage of say ls. 6d. an hour for one and a half hours, and also to an output bonus of one-half hour at two-thirds of ls. 6d. per hour, or 6d., making 2s. 9d. in all. This means that the worker was paid ls. 10d. an hour, or ls. 6d. plus a bonus of 4d. Bonuses are calculated on a weekly basis, normally based on the output of a gang and shared in proportion to the hours worked by each member as related to the total working time of the gang.¹

The scheme was eventually extended to cover all the main trade operations of the building industry.

At the end of the operation of the scheme under the Essential Work Order, 1941, ending in March, 1947, a report was published which showed the average actual output expressed as a percentage increase over basic. The average of all operations covered by the scheme was 34 percent over the average basic output. Some operations averaged over 60 percent higher than basic. Unloading,

¹"Building and Civil Engineering Industries," Ministry of Labour Gazette, December, 1947, p. 408.

for example, averaged 62 percent increase over basic; hutting showed a 67 percent increase. The lowest percentage of increase was hand excavation, which showed only seven percent.¹ Average actual bonus earnings on all operations were 27 percent over basic earnings. This was equivalent to 7d. per hour for craftsmen and 5d. per hour for laborers during the time they were engaged on work covered by payment by results.²

The general conclusions to the report on the scheme show that the Government's object of speeding production was achieved, and that in many cases there were substantial increases in output. There was no evidence that the use of the scheme adversely affected the quality of the workmanship, provided there was adequate supervision.

At the end of the period of the Essential Work Order ruling, in October, 1947, an agreement was made between the employers' and operatives' national bodies under which employers in the building industry could,

¹"Payment by Results in Building and Civil Engineering During the War," op. cit., p. 8.

²Ibid., p. 12.

if they wished, institute a system of payment by results. This is the first time that trade union approval had ever been given. The agreement was for an experimental period of two years, after which time it was to be reviewed for experience gained during that period of operation.

The National Federation of Building Trades Employers stipulates that an incentive system ". . . while providing the opportunity for an operative to increase his earnings by additional effort, should not, if it is to provide an incentive, carry any guarantee of a fixed bonus payment. This would amount to a disguised wage increase."¹

At the annual conference of the National Federation in June, 1949, actions showed that payment by results was still disliked by many union members. A resolution was made that the system be abandoned at the end of the two year trial period, but it was decisively

¹"Application of Incentive Payments to Building Work" (London: The National Federation of Building Trades Employers), June, 1949, p. 4.

rejected.¹

A Working Party was appointed in July, 1949, under the chairmanship of Sir Thomas W. Phillips, G.B.E., K.C.B., to inquire into the organization and efficiency of building operations in Great Britain. The Party reported that it could see no reason why incentive schemes should not prove generally beneficial. Some of its recommendations were that any scheme, to be successful, should be readily understood by the worker, that the standard should definitely be linked with output, that all targets should be properly planned--having reference to set conditions, and that during the period of work the worker should be able to compare his output with the target. Although there is certain specialty work which is not suitable for bonusing, the Working Party found no evidence to show that work done under incentive pay is generally of inadequate quality.²

¹"Builders' Bonus," The Economist, June 19, 1948, p. 1035.

²"Report of Building Industry Working Party," Ministry of Labour Gazette, May, 1950, p. 160.

Some employers seem hesitant to start incentive schemes because they consider supervisory and administrative costs too heavy. The National Federation of Building Trades Employers suggests that an incentive scheme should possibly be run with one bonus clerk to each 100 men employed.¹

The Federation found that there was a wide variation in percentages disbursed to workers for output over the target; however, it found 50 percent to be the most common. It is suggested by the Federation that a "bonus distribution of 50 percent of the difference between target and actual cost should be generally adopted throughout the industry in conjunction with the fixing of labour output on the basis of average output before the operation of incentive systems."²

Builders, union representatives and workmen have expressed views in favor of incentive pay, but attitudes are not always in favor of such schemes. Mr. F. Russon,

¹"Incentives--Problems and Performance," The National Builder, July, 1949, p. 295.

²"Application of Incentive Payment to Builders Work," op. cit., p. 8.

a Birmingham (England) builder and member of the National Federation of Building Trades Employers, says that in his experience incentives methods of payment have increased building productivity by 25 percent. Mr. E. F. Davis, managing director of Messrs. E. F. Davis, Limited, building contractors at Farnworth, near Bolton (England), says that since he began the construction of seventy houses for the Farnworth Borough Council, he has reduced costs, cut construction time, and increased wages through the use of a wage incentive scheme. In fact, he stated that efficiency has increased 50 percent and operatives have earned an average of one-third more pay.

Sir Harry Selley, president of the Federation of Master Builders says, "If we are to get production and the operative is to be offered incentive, we see no other way than through the pay packet." He goes on to add that when one man can lay two hundred bricks a day more than another, it is farcical that they should get the same amount of pay.¹

During an extensive visit to a two-hundred unit housing project in the Glasgow (Scotland) area, the

¹The Times, March 20, 1947, p. 2.

writer had several interviews with workers on the job. The majority expressed favorable attitudes toward the incentive scheme, but a few expressed a disliking. Bricklayers seemed to have greatest dislike, saying that they would much prefer an increase in their base pay. Not one worker was found who disagreed with the standards or targets. Of course, as was true with workers in all other industries, the men here expressed the feelings that the incentive of the bonus pay was ineffective because of heavy taxation.

It was impossible to reach any definite decision as to the percentage of building workers under incentive pay. One estimate was made to the effect that only about one-fifth of the total number of firms were operating under incentive schemes in Great Britain in 1948.¹ Two studies by the Ministry of Labour show a definite increase in the building industry from 1947 to 1949. The 1947 study² found only one percent on incentive

¹"Builders' Bonus," op. cit., p. 1035.

²"Proportions of Timeworkers and Pieceworkers in the Last Pay-Week in April, 1947, op. cit., p. 333.

pay, while the 1949 study¹ found six percent. However, taking the whole of the building trades employees in the United States, it is felt that the percentage would be considerably less than six percent.

Coal Mining

Coal mining is another industry where the trend in the United States has gradually changed from piecework to day work for the majority of the workers. At the turn of the century more than two-thirds of all workers in the mining industry of the United States were on piecework. Now the number of pieceworkers is less than one-fifth of the total.²

A study³ made in 1942 by the United States Department of Labor showed that payment by results was generally used in the coal industry, but a check with

¹"Proportion of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

²Industrial and Labor Relations Review, July, 1948, p. 616.

³"Incentive Wage Plans and Collective Bargaining," op. cit., p. 3.

the Commissioner of that Department clarifies this by saying that the study applied only to miners somewhat narrowly defined and ordinarily including hand or pick miners, cutters, and loaders. According to earlier studies made by the department, these groups comprised substantially more than half of all employees and were nearly all paid on a tonnage basis. The spokesman for the Department told the writer that a special survey covering 492 mines was made in 1945, which showed that at that time hand loaders still comprised the largest single group of workers and that about 65,000 of a total of 77,000 hand loaders were still tonnage workers. This same study also revealed that all incentive workers combined were then only about 22 percent of the total number of workers in the industry. Rapid mechanization in the industry since the war has further reduced the percentage of incentive workers.

In the United States the tonnage rates vary from district to district and even within districts, depending upon such circumstances as operating conditions, richness of seams, occupational classifications, and historical differentials. Some tonnage workers generally now

receive a combination of the earlier tonnage rates and various flat additions per hour or per day. An example of this is the additional 70 cents (5s.) per day which was awarded by the national agreement of March, 1950.

In the early days in Great Britain, the negotiation of a price list was indeed a most dramatic event in the life of a coal mining town, because the prosperity and character of the town were hanging in the balance on the "give and take" of a 1d. or 1/2d. per ton.¹ Piecework lists were the basis around which many struggles of unions took place. These early lists for every colliery and seam were simply posted by the management at the pit, that is if they were published at all.

Toward the end of the nineteenth century the unions became strong enough to get the lists fixed by collective bargaining, and they were able to enforce the ruling that a change in the list should be made only because of a change in physical conditions underground.²

¹Stanley H. Jevons, "The British Coal Trade" (London: Kegan, Paul, Trench, Trubner and Company, Limited, 1915), p. 350.

²Heineman, op. cit.

Since the mining of coal, especially jobs like coal trimming and bunkering, calls for great strength and utmost exertion, one writer¹ states that no man is strong enough to work regularly six days a week. He goes on to say that workers prefer a piecework system, not only because they can make higher earnings, but also because the miners can be freer in their comings and goings. In normal times (this book was written in 1928) the worker in this occupation "goes 'all out' for a few days, and then rests for a few days; and this would be very difficult under a time-work system."

At the annual Conference of Miners' Federations of Great Britain in 1916, the Lancashire and Cheshire delegates brought forward a resolution in favor of the entire abolition of piecework, basing it on the ground that it would reduce the danger of accidents.

Today the hewers or "getters" of coal at the face are usually on piecework, and at all the mines visited in Britain, this was on a tonnage basis for a gang. In some mines, development work, as well as in some other

¹Cole, "The Payment of Wages," op. cit.

conditions, the work becomes day work. This was true with one Fifeshire mine, where many faults were found. By a fault in this case is meant a place where there is a break in the coal seam.

Other underground workers and surface workers are usually day wage men. However, in some cases as many of the men as possible are considered a part of the gang for the purposes of payment. Men who build the supports for the roof are in some cases paid by results.

A scheme for a collective output bonus for a district as a whole was tried in September, 1942, but was not successful partly because the incentive to produce was so far remote from the individual worker. This scheme was based on the output of saleable coal in the district in relation to a standard or target. An increase of 3d. per shift was paid for every one percent increase above the standard, up to 15 percent, for which 3s. 9d. was paid. The bonus was payable for a period of four weeks.¹

¹"Wages in the Coal Mining Industry--Bonus for Increased Output," Ministry of Labour Gazette, September, 1942, p. 160.

Piecework prices are fixed by lists negotiated for each coal seam in the pit. A specified amount is given for the tonnage of coal dug. As in the United States, the prices vary not only from seam to seam, but in different parts of the same seam, according to physical and geographical conditions encountered.

In the Northumberland and Durham areas a fixed standard of earnings, called the "county average," is taken as a yardstick for each grade of pieceworkers at the various pits. The object of such a scheme is to enable the pieceworkers at each pit to earn wages approximately the same as the average for the county. If the cutters, or hewers, in one district find it impossible to earn an amount equal to the "county average" on their price list, they can, if the average deficiency exceeds five percent, apply for a revision.¹

Because of the difficulty in supervision in the coal mining industry, a method of payment by results has been more essential than in many other industries. However, because of the differences in natural conditions,

¹Heineman, op. cit.

piece rates are hard to reach with any accuracy. The work does not lend itself to time study and rate fixing as do the jobs in factories. Because of these difficulties, piece lists in the trade have been more of a trial for collective bargaining.

There is still a faction of leaders in the coal mining industry who express the view that mining under modern mechanized conditions is bound to endanger safety by excessive speed. Many would like to see the whole of underground work put on a strict day wage basis. As has been stated before, the National Union of Mineworkers states in point one of its charter that it is ". . . aiming at a general application of the day-wage system." At the Annual Conference of the National Union in May, 1949, it was agreed that sometime in the future the whole question of whether piecework should continue would need to be considered. However, it agreed that piecework should continue for the time being, even though it may have to be adjusted to take into account any alterations in the wage rates that may be effected. Further, it was decided that piece rates should be determined in accordance with the "existing machinery for

determining piece rates pit by pit."¹

As in the United States, the tendency with certain types of modern machinery is to eliminate piecework altogether. For example, the cutter-loader is usually operated by a team of six men who are paid day rates, plus a bonus for completing a certain number of operations. However, this day rate is in most cases fixed at a level that is equivalent to good piecework earnings under the ordinary methods. The turn of the century in Great Britain as well as the States saw an insistance upon piecework by all concerned in coal mining, with the majority of the workers being paid by results. However, at the moment the percentage of the total workers on piecework in the industries of both countries has fallen to an all-time low. One study² by the Ministry of Labour found that about 29 percent of British workers

¹"Report of National Executive Committee" (London: National Union of Mineworkers), May, 1949, p. 43.

²"Percentage of Time and Piece Workers, etc., Employed in October, 1947, Calculated on the Basis of the Total Numbers Employed in Each Industry," Ministry of Labour Gazette, April, 1948, p. 119.

in mining and quarrying were piece workers. Even though the figures gathered by the writer are not representative, it was found that the percentage would be even lower than this amount. At one mine in the Fifeshire (Scotland) area it was found that only one hundred and fifty of the total eight hundred workers were paid by piece rates. The percentage in this case is about 18.5. It was found that the majority of the coal-face workers were on piecework, but these workers comprise only a small percentage of the total workers of the industry.

Glass Industry

The glass industry divides itself into two main divisions--glass containers and flat glass. Of course, there are miscellaneous products such as tableware, lighting ware, and technical and scientific ware, but we are concerned with only the two main products. The main products of the flat glass industry are window glass, plate glass, safety glass and structural or architectural glass. In the United States this portion of the industry is dominated by two major companies, the Pittsburgh Plate Glass Company and Libbey-Owens-Ford

Glass Company. The two companies comprise about 80 percent of the entire glass industry, and are referred to in the States as "Big Glass."

The window glass cutters are generally on piece rates, whereas the other flat glass workers are for the most part on time rates supplemented by individual or group incentive earnings, especially in the two large companies.

The "Little Glass" group, representing all companies except the two larger ones, have no formal incentive plans, with the exception of two departments of one plant of the American Window Glass Company where the results have not been too satisfactory.¹ Contrary to the demand of the Federation to spread incentive pay to all occupations in the industry, local unions of the smaller companies have opposed any incentive system other than straight piecework.

The Libbey-Owens-Ford incentive system is applied to much larger groups and more maintenance workers, and also provides greater bonus earnings at the higher rates

¹"Wage Under National and Regional Collective Bargaining," (New York: Princeton University Press, 1946), p. 68.

of output than is true of the system used at the Pittsburgh Plate Glass Company. At Libbey-Owens-Ford the incentive system is a "50-50 plan" in which a standard is set either for individuals or groups, and the employees share 50-50 with the company for all production above standard. A spokesman for the company says that quality counts in this plan, for it is not just pieces or units that figure into the final data, but units that must pass rigid inspection tests. The writer found that at the Libbey-Owens-Ford Company, 78 percent of the hourly paid employees were under the incentive plan, under which the company guarantees base rates, each day's earnings being the basis for the calculation of incentive payment.

At the Pittsburgh Plate Glass Company the writer found about 500 men who were members of the Window Glass Cutters League of America, and about 10,000 employees who were members of the Federation of Glass, Ceramic and Silica Sand Workers of America--Congress of Industrial Organizations. The Window Glass Cutters are all paid on a straight piecework system. Of the 10,000 other workers approximately 1,600 were maintenance workers who

received no incentive pay. Of the remaining 8400 workers, approximately 5300 were remunerated by incentive pay based on productivity. The basic plan for incentive payment has been in existence in the company for about twenty-five years. It is a 75 percent sharing modification of the Bedaux plan. The majority of the workers are paid under this system, but there are scattered usages of other plans which have been installed in special cases, including some straight piecework installations, some standard bonus plans, and some simple production bonus plans. However, the special cases are very much in the minority.

In the glass container industry practically all the workers are on an incentive system of some kind. The Glass Bottle Blowers Association reports that all production workers are on an incentive rate based on the rate of production and the efficiency of the production. At the present time about 90 percent of the workers are on incentive pay, and unions and employers are striving to increase that percentage. A vice president of the Glass, Ceramic and Silica Sand Workers of America estimates that 50 percent of all glass workers are covered by incentive payment systems.

In Great Britain the flat glass industry still operates under price lists made in the late 1890's. The latest study by the Ministry of Labour reports that about 45 percent of all such workers work under piece rates.¹ Even though the London Glass Bottle Workers' Trade Society reports that the majority of its workers are employed under piece prices of the Lewis and Towers List, the same Ministry of Labour study reports that only 19 percent of the total number of workers in the glass container industry are paid by results. From these conclusions it appears that the number of workers in both the flat glass and glass container industries of the United States is much larger than the number in like industries in Great Britain.

Paper and Pulp Industry

The pulp and paper industry is divided into two sharply different types of operations--the basic processes of manufacturing pulp and paper, and the conversion of

¹"Proportions of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

paper into paper products. In the United States the industry consists of approximately 130 companies, 200 plants.¹ Ownership is widely scattered and no one company occupies a predominant position in the industry. There are about 450,000 employees in the whole of the industry in the States, and of this number more than two-thirds are in the conversion portion of the trade.

According to the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, in the pulp and paper mills, there are no incentive plans whatever, with the exception of one small mill in New England. The spokesman for the industry adds that this is due mainly to the fact that incentives are not readily applicable to basic pulp and paper manufacturing. In the converting end, on the other hand, incentives are fairly common. In fact, the proportion of workers on incentives is probably about 50 percent, and the number is growing.

Straight hourly pay is the method of compensation under the Uniform Labor Agreement in the pulp and paper

¹E. B. Alderfer and H. E. Michl, "Economics of American Industry" (New York: McGraw-Hill Book Company, Inc., 1942), p. 255.

industry of the West Coast in the United States. Many western mills had formal incentive or bonus systems when the unions in the first negotiation demanded complete elimination of all forms of piecework. The 1934 agreement contained a stipulation that existing incentive systems would not be extended within any mill or to any additional mills, and the 1935 agreement provided that the Bedaux and other premium payment systems would be discontinued in all mills of the pulp and paper industry.¹

In Great Britain, according to one of the outstanding union organizations in the paper making industry, it is traditional for workers in the industry to work on a strict hourly basis. However, in the interest of national economy, the policy has now been modified, and the union is now prepared to endorse payment by results. This provision is made with the stipulation that bonus payment will be assessed on the output of the department and not on the output of the

¹"Wages Under National and Regional Collective Bargaining," op. cit., p. 83.

individual worker. The spokesman for the union, its general secretary, states that very little progress has been made with individual schemes.

According to the latest study of the Ministry of Labour, based on the last pay-week in October, 1949, 15 percent of the paper and board workers in Britain were on payment by results.

During visits in Great Britain the writer found very few paper workers on any form of payment by results. One company in the Birmingham (England) area was making plans to install a bonus system based on the tonnage output of the plant. Another large company had only a profit sharing plan, and the managing director expressed the fact that even though all employees were paid an average of eight weeks pay under the sharing plan, he thought the effect too far remote from the individual worker to create much of an incentive. Too, he said, the tax reductions took so much of the amount that it was hard for the worker to realize that he had actually earned so much.

Even though the percentage of workers in the United States paper and pulp industry is substantially

greater than the total percentage in Britain, the number in neither country is more than 30 percent of the total workers in the industry.

Pottery

The pottery industries in both the United States and Great Britain are highly localized. In the States the chief center is the "East Liverpool district," which includes East Liverpool, Ohio, and two West Virginia towns just across the river from East Liverpool. In Great Britain the center is the area known as the "potteries" in Staffordshire (England). When the majority of the total working force of an industry is located in so small an area, it is much easier to get an idea of the wage payment system for the industry as a whole.

National collective bargaining in the pottery industry of the United States originated in 1900, between the United States Potters Association and the National Brotherhood of Operative Potters. The 1900 scale contained descriptive enumerative lists in each of the pottery branches. Even though many changes have

been made in these lists from time to time, their general character has remained unchanged. The original list was made by assembling the prices in effect in all the plants of the industry and striking an average, with departures here and there from the strict average for strategic consideration.¹

The list includes piece rates for only a fraction of the pieces actually made, but it covers enough of the varieties and categories of ware so that new pieces may be fairly priced by using the listed prices as norms or standards.

During the many years the lists have been in operation the inequalities in the original lists were increased. Some new articles were priced on the basis of articles already in the list which were relatively overpaid or underpaid. In some cases inequalities have developed through the acceptance of an assumed degree of difficulty in a new article which was later found to be mistaken. Many other discrepancies have developed

¹David A. McCabe, "National Collective Bargaining in the Pottery Industry" (Baltimore: The Johns Hopkins Press, 1932), p. 145.

through alterations in methods of making certain articles. Requests have been made to consider the adoption of time work exclusively, but employers have repeatedly stated that workers will generally turn out only about two-thirds as much per hour when employed regularly under the time rate system as under the piecework.¹

The piece rate consists of a specific rate per dozen of wares and a percentage "plussage." For the kiln workers a special "kiln day" unit based on cubic measurement was used until a new type of kiln made the introduction of a time rate necessary. However, a piece rate system for this new type kiln has been introduced in some plants, with the result that average hourly earnings for the operators increased as much as 40 percent.²

In the pottery industry, the only large branch exclusively on the time work system is that of the

¹"National Collective Bargaining in the Pottery Industry," op. cit., p. 179.

²"Wages Under National and Regional Collective Bargaining," op. cit., p. 21.

warehousemen.

An investigation into earnings of pottery workers in the East Liverpool, Ohio, district, made by the United States Department of Labor in 1944, showed that about two-fifths of the male workers and one-half of the female workers were employed on an incentive or piecework basis.¹ The president of the National Brotherhood of Operative Potters advised the writer that 40 percent of the workers are female and 60 percent male. Men are employed in the higher paid and more skilled processing and maintenance occupations, while women are generally engaged in simpler and somewhat repetitive occupations, but in some cases they perform the more skilled occupations on the moderately priced wares. Contrary to the percentages concluded by the Labor Department, Mr. James M. Duffy, president of the National Brotherhood, says that the pottery industry is generally an incentive wage setup, and estimates that for the most part, as many as 80 percent of the workers in the industry have been under payment by

¹Monthly Labor Review, October, 1944.

results since the initiation of the original piece price list. Percentages as high as this were found at plants visited by the writer.

In Great Britain pottery is also traditionally a piece rate industry. Mr. Harold Hewitt of the National Society of Pottery Workers advised that at the present time about 85 percent of the workers are pieceworkers, and stated further that piecework has been in operation in the industry as far back as records go. The Trades Union Congress also estimates that 85 percent of the total number of workers in the pottery industry are employed on piecework.¹

The price lists in Great Britain have been agreed upon in somewhat the same way as in the United States. To replace the "guessology" of the past, the stop watch has moved into one of Britain's pioneer companies, Messrs. Josiah Wedgwood and Sons, Limited, Barlaston, Stoke-on-Trent (England). This is the first time that such a long-term experiment has been tried in Britain's

¹"Royal Commission on Equal Pay," Cmd. 6937, His Majesty's Stationery Office, London, 1946, p. 69.

oldest industry. At the time the writer visited the concern in August of last year, the managing director stated that the scheme had already raised output by 20 percent. This increase was badly needed in cutting down the four years back-log on export orders.

In the tradition-bound pottery industry, management found many difficulties in introducing the new time and motion techniques. At first, there was an increase in labor turnover. Even though some workers stated that they would leave rather than work under the new plan, the truth could not accurately be established that the system was the real reason for their dissatisfaction.

Mr. Hewitt of the National Society of Pottery Workers stated that at first he did not feel too happy about the new system, and although it seems to be working well thus far, he would not express a final opinion until it had been given a longer trial.

The management at Wedgwood estimates that it will take several years before the new plan of scientifically applied piece rates replaces the traditional system of

"guessology" through the whole of the plant.¹ Some of the most important factors in the new system at the company are a replanned method of feeding raw materials to the operatives, and a new layout in all the departments involved. In many cases, specially designed equipment and more effective lighting helped to reduce the time of operations. Time of many operations has been reduced by as much as one-third.

The plan was begun by a firm of industrial consultants, which trained time and motion specialists within the firm at Wedgwood. At the present time all work is done by the company staff. As the scheme is spread throughout the plant, the misunderstanding of workers is disappearing. Chats with many of the workers convinced the writer that they are satisfied.

Printing

Traditionally the payment of workers in the printing industries of both Great Britain and the United

¹"Long Term Plan Replaces 'Guessology' at Pottery," Target, May, 1949, p. 2.

States has been on a day work basis. The almost complete absence of incentive wage systems is due largely to the opposition of the unions.

In the United States very few union printers work under incentive plans, although a few of the large non-union publishing houses pay a piece work price. The International Typographical Union has adopted a constitutional provision prohibiting its local unions from accepting piecework or payment by any other incentive method.¹ The International Printing Pressmen and Assistants' Union of North America reported that there are very few wage incentive plans among its members, and stated further that the attitude of the union is one of disfavor. Study Number 86 of the National Industrial Conference Board indicates that the percentage of production workers in the printing industry who are covered by incentive plans is as much as 25.6 percent, but from all indications from unions and from employers visited, it seems that the percentage

¹"Incentive-Wage Plans and Collective Bargaining," op. cit., p. 3.

would be much less than this, perhaps as low as 15 per-cent.

According to the October, 1949, study by the British Ministry of Labour, only nine percent of the total workers in the printing industry are paid by results. The research officer of the London Society of Compositors reports that a large number of its members are employed on piecework. In fact, the first price list dates back as far as 1785. Mr. W. A. Morrison of the National Union of Printing, Bookbinding and Paper Workers, says that until just recently his union was traditionally opposed to any form of payment by results. At present, he adds, the policy has been modified in the interest of national economy, but very little progress has been made with individual schemes.

Modern schemes of payment by results are practically unknown in the printing industry, but the cloistered precincts of one of Britain's older universities now houses a recently introduced plan unparalleled in the printing world. The writer spent three days with the Cambridge University Press studying the plan and its results. Every person approached was very much

impressed with the scheme. The overseers said that complaints have been almost nil. In the proof reading department, where the problem was approached with some hesitancy, Mr. Newman stated that he had not received a single complaint. Mr. Willers of the compositors spoke of the hidden factors in his department which could not accurately be taken into consideration. He said that there is planning which the operative must do which could not be accurately estimated. Some examples of his questions were, "How long will it take a man to plan the layout of a table on a page?" and "How long will it take a man to correct an error?"

The Press employs about 300 workers, of whom about 200 are skilled operators. There had been no piecework among the workers for many years. The last report from the University Printer was that 85 percent of the total number of employees had been covered by the incentive scheme, and plans called for 100 percent coverage in the near future.

The whole approach to the plan appeared so impressive that it is felt important enough to deserve some discussion. The small number of workers at the

Cambridge Press constitute only a small percentage of the total 93,400¹ employed in the printing trade in Britain, but since it is something new to the trade, and since its installation was watched so closely by the printer unions, it will undoubtedly set a good example of payment by results for the whole of the printing industry.

The idea of the system of payment by results was conceived in 1947, and in trying to establish a basis for measuring output, the management found that production records could not be adapted for the purpose; therefore it was decided to employ a firm of industrial consultants.

A meeting of the employees was called and it was decided to proceed according to the following stages:

(1) Invite a representative of a consulting firm to come and explain its methods.

(2) If everyone was thus far satisfied, the consulting firm would be instructed to work out a detailed scheme with the help of representatives of

¹"Number of Persons Employed in Selected Industries," Ministry of Labour Gazette, September, 1949, p. 386.

management and chapels.

(3) The scheme would then be submitted to management and employees for fullest consideration and if agreed upon would be applied for a trial period.

(4) If satisfactory to all concerned, the plan would then be adopted permanently.

At first the reactions of the employees varied. There were some who remembered unsatisfactory piece rates, and were hesitant to approve the new system for fear that it, too, would be unsuccessful. However, after some consideration it was decided to proceed with the plan.

A consulting firm, Personnel Administration, Limited, of London, sent its representative, Mr. Batten, to Cambridge to make the first appraisal, and agreed that a profitable scheme could be installed. The firm made the stipulation that if at any time during the assignment the Press could decide to discontinue, being liable for fees only to the date of discontinuance. The first step was to appoint a resident consultant, whose task was to train a representative of management and a representative of the workers in the methods of

time study and performance assessment. The resident consultant was originally the plant cost accountant. He is assisted by two time study men, four bonus clerks and six accessors in the compositor room. The University Printer hoped to reduce the accessors to three eventually. In fact, the goal is to have a staff for the operation of the scheme in the proportion of one person to every 40 or 50 operatives.

The scheme was begun in the machine room. This automatically gives rise to the question of whether application should be made department by department or in all departments at one time. The latter procedure would seem fairer, but in the case of so many departments it would certainly overtax the administrative organization. The interval between the application in the first and last departments, however, should be as short as possible. Proceeding with the machine room, the operations were broken down into their component elements and time studies were made on different operatives on different machines and in every possible variety of conditions. Standard times were concluded for each element and a total established for the whole

operation. Allowances were added to cover rest, special physical or visual strain, and contingencies. The final time was expressed in standard minute values (S.M.V). These values were checked against actual current production, and where necessary further time studies were made. After all minute values were finally found satisfactory, tables were made out covering all classes of work, and after approval by the management, these values were established as the standard or 100 percent performances, any improvement upon which would earn bonus.

The incentive pay is based on weekly performance. The number of minutes in a 43-1/2 hour week being 2,610, an operative receives bonus calculated as his basic hourly rate for every S.M.V. over 2,610. If an operative is kept waiting for more than five minutes through faults beyond his control, he is paid day-work rates for such times. It was agreed to give the scheme a trial of one month, and if values were considered unfair, new studies were made. Values were not to be changed except in the case of obvious miscalculations or the introduction of new equipment or changed methods.

When the machine room was completed, all the other departments had agreed upon the scheme, and it was possible to work out plans for each department in turn. The operations in the machine room presented conditions which were not found in some of the other departments, because in that portion of the firm output was more directly linked with the performance of the individual worker. Some of the other departments demanded many modifications in order to take care of technical complications.

In the monotype departments standard minute values were worked out based on one thousand "ens" of copy set. Even though values were set for almost all variations of work, it was found that an operative might have to work on a bad manuscript for a long period of time and be unable to meet the requirements for a satisfactory bonus. To alleviate this difficulty, half of the standard minutes earned by each operator in the department were credited to him, and the other half went into a pool which was divided evenly among the operatives in the department, on the basis of the individual hours worked. With the casters, bonus is

paid on a group basis.

It would seem that an accurate appraisal of proof-reading would be one of the most difficult operations in the whole of the scheme, because it includes familiarity with mathematics, foreign languages, and scientific and specialized subjects. However, studies showed that when the reader had the right experience, he read with remarkably constant speed. Values were allotted per 1,000 ens in each category of the reading. In order to offset the loss in incentive earnings due to irregular factors that might prevent the reader from reaching a reasonable efficiency performance, as well as to prevent too great a premium on very high output in what is considered an inspection operation, a stabilizing factor of 133 was introduced. Under this plan a performance of 125 is paid at the rate of $(125 + 133)/2$, or 129, and a performance of 145 would earn incentive pay on the basis of 139 percent efficiency.

For other departments such as the bindery and foundry, the schemes were based on the actual minutes saved, following the same principles as have been

described. A different system was necessary in the indirect departments such as the warehouse. Here "point" values were allocated for different types of work done, and group bonuses were paid according to the number of points earned over and above a certain number. The values were somewhat stabilized so as to eliminate extremes due to fluctuations in volume of work.

Foremen and indirect workers in productive departments were paid a bonus related to the total performance of the department.

The scheme has proved to be a very effective tool for planning the work of the Press. A constant flow of accurate and up-to-date information is always at the fingertips of the management. The Printer knows exactly what is happening, to a degree that no printer has ever had before. Not only does the Printer know, but management has consistently explained to the workers what it is doing, why it is doing it, and invited criticism and suggestions.

Much criticism was at first received from the unions, as well as from other printers. Any desirous person was invited to inspect the scheme in operation

and draw his own conclusions. One particularly insistent critic was finally convinced to come to the Press and inspect the scheme in operation. When he came to the assessors' room, he found a young girl making an assessment for an obituary. The critic inspected the copy closely and finally stated that he would allow an hour and three quarters for the operation. Shortly after, the assessor had worked out the minute value at sixty-one minutes. The critic was quite satisfied when the operator who finally set the obituary worked at a performance of 133 percent efficiency, so that the actual time taken was only forty minutes.¹

And what is the effect of the scheme on production? The University Printer stated that departmental efficiencies were about 125 percent, but that many departments often averaged more than 130 percent.

This scheme is not discussed here because the writer thinks it necessarily ideal for the whole of the

¹Philip Heworth, "Six Major Benefits from One Incentive Scheme," Business, April, 1949.

printing industry, but because it presents the many problems involved in selecting and installing an incentive plan where many modifications and deviations are necessary. Not only this, but the scheme, after its installation, accomplished all the goals of a successful incentive plan. It has secured increased productivity, higher pay for workers, more efficient planning, accurate measurement of output, closer costing, and redeployment and reorganization.

Rubber

The rubber industry is divided into three major classes or subindustries consisting of, first, the rubber tire and inner tube industry; second, rubber boots and shoes; and third, other rubber goods. Most of the information given in this discussion represents the rubber industry as a whole.

In the United States the piece rate system of wage payment is very widely used in the rubber industry, but the incentive systems include a great many types, from straight piece work to the more complex systems, such as modified Bedaux. From all findings, it seems

that incentive pay is most widely found in the tire and tubes branch of the industry. Time and motion studies were made in a few plants in the tire industry prior to World War I, but they did not find widespread application until the nineteen-twenties. The techniques are in use throughout the industry with the exception of a few of the very small plants. A study¹ by the National Industrial Conference Board found that in 1947, over 83 percent of the firms included in the study used time and motion study.

The United Rubber Workers of America estimates that incentives are by far the most predominant method of wage payment in the tire and tube branch, covering approximately 70 percent of the workers. The Union, in its 1948 contract, expressed a strong desire for the widespread use of wage incentive plans. One of its agreements with a rubber manufacturing plant states that "The union and company will cooperate in an effort to maintain as high a percentage of piecework

¹"Personnel Activities in American Business," op. cit., p. 29.

coverage in the plant as is practicable."

The 70 percent conclusion for tire and tube workers is a little high for the industry as a whole, as far as findings by the writer are concerned; however the National Industrial Conference Board found the percentage of incentive workers to be almost 80 percent, and the United States Department of Labor found the practice to be general.¹

The 1949 study by the Ministry of Labour found that 57 percent of all rubber workers in Great Britain work under system of payment by results.² The writer found the percentage to be considerably higher than this. His visits included rubber plants employing about one-fourth of the 93,900 rubber workers³ in Great Britain. Dunlop Rubber Company Limited, Fort Dunlop, Birmingham (England), employing 16,500 workers,

¹"Incentive-Wage Plans and Collective Bargaining," op. cit., p. 3.

²"Proportions of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

³See p. 386, Ministry of Labour Gazette, November, 1949, op. cit.

uses piecework rates which cover about 80 percent of the rubber workers.

The North British Rubber Company, Limited, of Edinburgh, employing 4,500 workers, operates an incentive scheme for 75 percent of the direct workers. There are still a few employees under old piecework rates, but the majority have been included in the new incentive method of payment. The plan is devised in accordance with the National Joint Industrial Council Agreement which specifies that an operative of average ability, when exerting average effort, should earn 25 percent above the appropriate basic time rate on which alone the bonus earnings are calculated. It is interesting to note that all the companies visited by the writer in both countries were engaged in all the three major classes of the rubber industry, but the 79 percent found to be under some method of payment by results is not thought to be representative of the industry as a whole.

One interesting scheme in Great Britain which has been widely publicized is the merit rating plan at the Henley's Tyre and Rubber Company Limited, Gravesend

(England). The employees are rated under five headings: (1) quality and quantity of work, (2) application, (3) effort and initiative, (4) cooperation, and (5) attention to safety and care of tools and materials.

Every job is assessed each three months. The management reports that without question, workmanship and quality are far better than before the scheme was started. Apart from such tangible gains as increased production and reduced waste, there has been a decided reduction in lateness and absenteeism. There has been a definite change in outlook through the whole of the factory and through the processes which go to making a tire. The proud slogan of the company is "Henley Tyres--Built With Incentive."

Shipbuilding

Shipbuilding was selected for study for several reasons. In the first place, ships are made by the custom building process in contrast with mass production methods. A ship is the largest and most expensive movable thing man makes. For example, the "S. S. Queen Mary," is almost a fifth of a mile long, and cost 30

billion dollars to build.¹ Except when the United States is involved, directly or indirectly, in a war, she is not a leader in shipbuilding, while Great Britain is noted as the leading shipbuilding nation.

Another reason for visits to the shipbuilding yards in Great Britain was the fact that the writer was interested in the old price lists still in operation. Uniform riveting price lists are agreed upon to cover very wide areas of the country. The two main lists now in operation are the Clyde lists, covering Scotland and Barrow, and the Tyne and Wear List, covering the Northeast Coast and Birkenhead. The Tyne and Wear List dates back as far as 1882, and the Clyde List was originated in 1889. Both riveting lists are based on a given number of shillings per one hundred rivets driven, the rate being based on the diameter of the rivet and the weight of the plate. The lists are very elaborate, the Clyde List for new work including 343 items and 24 qualifying notes.

¹Alderfer and Michl, op. cit., p. 124.

Lists for platers are less uniform, because of the great variation in technical methods between various shipyards. Such lists are usually fixed on a district basis, but on the Clyde List they vary from one shipyard to another. The prices are based on a given price per square foot of plating. Piecework lists are also in existence for such workers as caulkers, drillers, welders, blacksmiths, angle-iron smiths, etc.

The lists of piecework prices apply when the workers are engaged on new work, but lieu rates are paid in many cases to those engaged on repair work. A lieu rate here may be described as hourly rates fixed in relation to work which cannot be accurately priced on a strict piecework basis, but which is done at piecework speed by traditionally pieceworking classes.¹

During the last war agreements were reached authorizing the extension of payment by results to such categories as electricians and painters. Such payment

¹"Industrial Relations Handbook," op. cit., p. 66.

is also increasing among shipwrights. Wartime extension of pieceworking among traditional time working trades has tended to favor the group system.

The payment of workers engaged on group piecework is done in a variety of ways. In some cases all the men of the gang receive a specified proportion, while in other cases only the gang leaders are paid on a piece basis, and the other workers are paid time wages. In some cases the gang leader hires his own men, and he is responsible for dividing the pay earned by the gang. At one of the largest yards on the Clyde, the writer found that the amount earned by a riveting squad is arrived at on Monday, and a note of the total amount is handed to the squad leader on Tuesday on a sheet giving the names of all the men in the squad. The squad leader enters the amount to be paid to each man and the form is returned for the appropriate income tax deductions. The final pay for each man is paid out on Fridays to the leader, but each man's pay is in a separate envelope, which gives the amount and deductions.

Since 1936, increases in wages have been given to pieceworkers at the same time they are given to time

workers. Up to September, 1939, these were in form of percentages, an increase of two percent for every shilling given to time workers. Since that time, advances have been given at flat rate increases, the same as with time workers.¹

At the yards on the Clyde, the writer found at one place that as many as 90 percent of the workers were paid by results. Of this percentage, one-fourth of the men were on individual rates and the remainder on group rates. At the time of the visit, the yards had introduced time study for building new rates, and had been encountering considerable trouble with the unions.

For the whole of the shipbuilding industry, including ship repairing, the percentage of the total number of workers on payment by results is probably between 50 and 60 percent in Great Britain. The October, 1949, study made by the Ministry of Labour found the percentage to be fifty-four.

¹"Industrial Relations Handbook," op. cit., p. 67.

In the United States, incentive plans were chiefly employed at shipyards in the East Coast yards at the beginning of the last World War. Very few were in operation on the West Coast, the Gulf of Mexico, and the Great Lakes. During the war practically no shipyards initiated thoroughly engineered individual time-studied plans. Several, however, installed plantwide incentives based on hours per equivalent ship completed, or upon standard cost and actual cost. Many yards already having incentive plans extended them to new groups and new types of work.

A detailed study¹ was conducted during World War II with six leading shipyards in the United States. The study included Bethlehem Steel Shipbuilding Division, the Electric Boat Company, Ingalls Shipbuilding Corporation, New York Shipbuilding Corporation, Newport News Shipbuilding and Dry Dock Company and the Sun Shipbuilding Company. In all six companies,

¹"The Shipbuilding Business in the United States of America," Vol. 1, written by a group of authorities, edited by Professor F. G. Fassett, Jr. (New York: The Society of Naval Architects and Marine Engineers, 1948), p. 310.

some form of wage incentive plan had been in operation before the war, some of the systems dating back as far as 1899. Some of the plans were designed by consulting engineers and others were developed by the personnel within the company.

Over 112,000 employees of the total of about 150,000 working for the six reporting companies participated in incentive plans. The total number of employees in the shipbuilding and repairing industry in the United States in February, 1950, was 161,300.¹ But this is not a fair comparative figure because the number is greatly increased during a time of war.

A representative case in the study is that of a yard employing 23,649, of whom 19,143 were on direct and 4,306 on indirect operations. Of this number, 10,283 direct workers were on incentive--30 percent on an individual basis and 70 percent on a group basis. No indirect workers were included. In another yard 17,000 of the 19,000 employees were on some form of

¹"Employees in Non-agricultural Establishments, by Industry Division and Group," Monthly Labour Review, February, 1950, p. 83.

payment by results. The first case, totaling about 54 percent of the direct workers seems to be more representative than the last one, where the percentage was almost 90 percent. At least the 54 percent is more in line with other studies; however, the over-all percentage of employees in this study is more than 70 percent.

Steel and Iron

The steel and iron industries are so intricate that a thorough study could not be made in the limited time available. The information gathered is in most cases from printed sources and organizational studies. Since the steel industries in both Great Britain and the United States are so widespread, it is feared that the information gathered was far from representative. In the United States the writer was able to cover a goodly portion of the Pittsburgh area, the heart of the industry, but in Great Britain, visits were of necessity restricted to the Glasgow (Scotland) area.

In Pittsburgh, it was generally found that the percentage in the various plants, including all

operations--from smelting through fabricating, paid by incentive methods, was somewhere between 40 and 50 percent. In the basic steel plants, pay is often based on tonnage. At some of the plants the percentage on incentive pay went as high as 100 percent, in one particular case a plantwide group bonus plan being used.

There seems to be more controversy as to the number on incentive pay in the fabricating branch of the industry. One study¹ made by the United States Department of Labor found that incentive wage systems were rarely used by fabricated structural steel plants. The study covered 324 establishments, only 14 of which reported a significant proportion of their workers on an incentive pay basis. As might be expected, a greater proportion of the larger establishments had adopted incentive wage plans. Considering the total number of workers in the plants studied, only seven percent were under an incentive basis. It is doubted that the outcome would be the same if a similar study were taken

¹"Wage Structure of the Fabricated Structural Steel Industry," Bulletin No. 866, United States Department of Labor, January, 1945, p. 9.

today. There has been a tremendous growth in the use of incentive pay in the Pittsburgh area since the war. At the writer's place of employment, which is the largest fabricating plant in the world, almost 70 percent of the workers are covered by incentive pay.

The United Steelworkers of America, located in Pittsburgh, reported that the percentage of direct workers in the whole of the industry was about 50 percent at the present time. The Research Director reported that there are probably more fabricating workers than basic steel workers covered by incentive plans. A 1942 study by the United States Department of Labor found that more than half of the employees in the steel industry are either piece or bonus workers.¹

In Great Britain the number of workers in the whole of the steel industry on incentive pay is more than 50 percent. At every installation visited the percentage was greater than this. One large Glasgow firm paid every productive worker of its 2,500 employees

¹"Incentive-Wage Plans and Collective Bargaining," op. cit., p. 4.

on an output basis. The plate shop was paid under a "pool" basis. By agreement with the thirty men in the shop, any bonus earned was split evenly among all of them. A rate was set on every job, but one man might earn 80 percent bonus, while a slower man might earn none; still, however, the slower man received the same amount of bonus as the more efficient one. Under such a plan, the incentive was questioned, but every worker seemed content, and the shop as a whole averaged 40 percent bonus.

A recent study¹ by the British Ministry of Labour showed that the percentage on incentive pay in every branch of the steel industry was more than 50 percent. Some examples are blast furnace workers--51 percent, iron and steel melting, rolling--61 percent, iron foundries--51 percent, steel sheet manufacture--52 percent, and iron and steel tubes--54 percent.

The General Secretary of the Iron and Steel Trades Confederation of Great Britain reported to the

¹"Proportions of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

writer that in all sections of the trade, the overwhelming majority of the workers are on piecework and other incentive systems of payment, which have worked very well over a long period of years, and "have contributed to a considerable extent to the industrial peace which has existed in the industry."

Textiles

It is not the intention of this report to go into the technicalities of the textile industry, but in explaining in a cursory manner how some of the piece price lists are compiled, some terms peculiar to the cotton industry will of necessity be used. The whole of the textile field was not explored because of its many complexities, but findings in such branches as cotton, hosiery, woolen and worsted textiles, and textile finishings are briefly explained.

The textile industry is the home of piecework systems. In Great Britain, district piece price lists have been in operation in the cotton industry for almost a hundred years, and in the hosiery making industry

since 1886. Out of the total number of spinners and twinners who were members of a trade union in 1909, as many as 10,180 had their wages regulated by the Oldham List, 5,584 by the Bolton List, and the remaining 7,157 by individual lists.¹

Piece price lists were originally compiled by the individual mill owners. Gradually these were consolidated into definite agreements between the union and the employer, and as organization grew a chosen list began to be applied over a wider area.

The Oldham List covered operative cotton spinners. Based on payment for the actual length of yarn produced, a simple standard was established for work carried on under the most ordinary conditions and from which all variations may be easily regulated. The first element taken into consideration was the number of spindles on the mule. All other conditions being equal, the mule with the greatest number of spindles will spin the greatest number of hanks within a given time. The next

¹"Report on Collective Agreements Between Employers and Workpeople in the United Kingdom," His Majesty's Stationery Office, Cmd. 5366, 1910, p. 139.

element for consideration was the length of travel or "draw" of the machine. The "draw" represents the length of cotton that might most safely and conveniently be twisted, drawn out, and wound into reels on the spindles, at one operation. An example of a rate might be given as a number of spindles making three "draws" of 63 inches each in 50 seconds.

One of the earliest piece price lists adopted in Britain was the Bolton List, first prepared in 1858, giving prices for spinning twist, reeled yarn or bastard twist, and weft on "self-actor mules." Broadly speaking, the difference between this and the Oldham List involved matters of form rather than of substance. The unit of piece rates at Bolton, so far as the general list was concerned, was one hundred pounds weight of yarn, but under the Oldham List the unit was 1,000 hanks, each hank being 840 yards in length. In some mills, the Bolton List uses the unit of one hundred "draws."

In place of the varied and complex district price lists, the workers of the Amalgamated Association of Operative Cotton Spinners and Twiners have been

governed by the "Evershed" Universal List of Prices and Conditions for Mule Spinning since February 7, 1949.

The new list contains a table of basic weekly time and piece wages for spinners minding mules of various length, together with variations for such factors as the speed at which the mules are run, as well as prices for extra work.

The weaving branch of the industry has used a Uniform List of Prices since it was originated under that title in 1892. The list is in two parts, one for grey cloths, based on a fixed price for 100,000 picks of a standard cloth of a given width, made of weft and warp of a given standard of fineness. The other one is for colored cloths, in which there is substituted for price per 100,000 picks a price based on 70 yards of warp.¹ After a study of the Uniform List, the Cotton Manufacturing Commission concluded that "If the

¹"Interim Report of an Inquiry Into Wages Arrangements of Methods of Organization of Work in the Cotton Manufacturing Industry," made by the Cotton Manufacturing Commission, London, His Majesty's Stationery Office, February 16, 1948, p. 8.

proper aim of a wages system for cotton weaving is to relate reward to effort, then the Uniform List is fundamentally unsound, because it largely ignores the two factors which chiefly determine the amount of effort required from the weaver." Finally the Commission stated, "The Uniform List must go."¹

A new weaving wage system has been devised to cover the redeployment of weaving operatives employed in the manufacturing industry. The new system is the culmination of years of joint consideration arising out of a joint conference of representatives held November 4, 1946. The new system was given a test over an eight-week period, during which time wages were paid under the Uniform List, and calculations were made as to what the wages would have been under the new scheme. Such tests were highly successful, and at a meeting of the General Council held on August 20, 1949, the system was approved.

The new system is based on (1) careful measurement of workload, which in turn implies: - (2) improved

¹"Interim Report of an Inquiry Into Wages Arrangements of Methods of Organization of Work in the Cotton Manufacturing Industry," op. cit., p. 15.

preparation and higher qualities of yarns, (3) improved machine conditions and layout, and (4) division of labor between the skilled and unskilled operatives.¹

The conditions given to firms and trade unions in a joint agreement between the Cotton Spinners' and Manufacturers Association and the Amalgamated Weavers' Association specify that the new wage system can be introduced at a mill by joint desire and content. For a time there will be two wage systems operating side by side--the Uniform List and the C.M.C. System, but it is felt that ultimately only one of the systems will operate in any one mill.

The new wages plan involves two main factors. The first point includes individual timings of weft and warp work, and allowances for contingencies, supervision, skill, synchronization, and rest and relaxation. No stipulation is made as to a uniform method of studying and assessing the workload. The second point is covered by the wage formula recommended

¹"History and Mathematics of the C.M.C. Weaving Wage System," Accrington (England), Amalgamated Weavers' Association, June, 1950, p. 5.

by the Cotton Manufacturing Commission, and such formula, with amendments, forms the basis of the new joint wages agreement outlined in the Official Handbook.¹ Details of the plan will not be given here, but the real basic formula of the wage system is as follows:²

$$\text{Weekly Wage} = (K + .67 \text{ W.F.}) \times \frac{92 + 4G}{108} \times \frac{\text{Attained Efficiency}}{80}$$

Explanation of terms: (K + .67 WF), where K represents the More Looms differential and the allowance for fibers used; where WF represents the warp and weft work done. Both K and .67 WF represent shillings.

$\frac{92 + 4G}{108}$, which is the grading and represents skill and supervision.

$\frac{\text{Attained Efficiency}}{80}$, which represents the actual attained efficiency as compared with the standard of 80 percent.

In order to make the new system better understood, the Association is sponsoring lectures, week-end schools,

¹See "Official Handbook of the Agreed Conditions of Introduction, Rates of Payment and Methods of Calculation for the C.M.C. Weaving Wage System," approved and authorized by the Cotton Spinners' and Manufacturers' Association and the Amalgamated Weavers' Association, December 13, 1949.

²"History and Mathematics of the C.M.C. Weaving Wage System," op. cit., p. 8.

and area meetings, to give district officials the utmost information possible. The General Council undertook responsibility for paying any extra costs involved in district officers attending special schools established by the Cotton Board for the study of workload systems. The first look at the formula creates confusion with the average person, especially if he is not wholly familiar with the cotton industry, but the handbook furnished by the Association gives a very careful analysis, which presents the system in clear, understandable terms.

In the United States, a study of the cotton industry was made by the Department of Labor in 1940. The 251 mills included in the survey employed approximately one-fifth of the workers in the industry and represented all important cotton goods producing areas in the United States. Approximately 42 percent of the workers studied were employed under some form of payment by results, the largest number of these being on straight piece rates. Complicated bonus systems were

rarely found.¹ The latest study by the Department of Labor sets the percentage of total workers on incentive payment at 35 percent.²

Since 1929, the American Federation of Hosiery Workers and the Full-Fashioned Hosiery Manufacturers of America have negotiated uniform piece rates in the United States. National uniformity was temporarily abandoned for the period from 1938 to 1941, during which time individual company scales replaced the uniform piece rate system, but it was restored in 1941.

The piece rate structure for the hosiery industry is complex and complicated. Rates per dozen vary with type of machine, machine speeds, kind of raw material, type of product, and a number of other factors. In addition to the piece rates, there are "extras," or fixed amounts to be added to the piece rates for each

¹"Effect of Incentive Payment on Hourly Earnings," Bulletin No. 742, United States Department of Labor, 1943, p. 7.

²"Supplementary Wage Practices in American Industry," op. cit., p. 7.

dozen of a certain style produced. The schedule of rates is more than twenty pages long.

The scale of piece prices for the hosiery industry shows the difficulty of establishing a national schedule of piece rates in the United States. Full-fashioned hosiery, for example, is manufactured in New England, the Middle-Atlantic States, the Mid-West, and the South. The cost of living and the average earnings vary greatly when such a wide area is considered. In the northern mills rates are practically identical; in the border states (Illinois, Kentucky, and Tennessee) rates average about 10 percent below the rates included in the National Labor Agreement; and in the South the average is about 15 percent below the northern level.

There were many indications in hosiery mills in the United States that as many as 85 percent of the productive workers of the industry are piece rate workers. The Research Director of the American Federation of Hosiery Workers informed the writer that the number of employees on a straight piece rate system was about 80 percent. The United States Department of Labor found 73 percent of the full-fashioned and 68

percent of the seamless hosiery workers paid by some system of payment by results.¹

In Great Britain about 70 percent of the hosiery workers are paid by results.² At individual firms the percentage was found to be much higher, but the smaller numbers at other firms would appear to bring the average down to the 70 percent figure established by the Ministry of Labour. A highly successful scheme, set by motion and time study exclusively, was found at the Jantzen Knitting Mills, Limited, at Brentford (England). Eighty percent of the employees were covered by the incentive plan, and the Managing Director pointed out that the average efficiency of the workers is 150 percent.

At the hosiery center of Hawick (Scotland), a consulting firm has been endeavoring to establish a schedule of rates that will apply to the whole area.

¹"Supplementary Wage Practices in American Industry," op. cit., p. 7.

²Ministry of Labour Gazette, March, 1950, p. 86.

A representative of one firm in Hawick expressed the opinion that such a scheme would be impossible because of such factors as the difference in quality demanded by the various companies. At the time of the writer's visit, the consultants had spent two and one-half years working on the scheme, and had covered only about 14 percent of the working force at Innes, Henderson and Company, Limited, Britain's largest hosiery manufacturers.

An interesting comparison of the percentages of workers in the various branches of the textile industry can be made of studies of official sources in the United States and Great Britain. Findings, made by the Department of Labor¹ and the Ministry of Labour² are given below:

Branch	United States	Great Britain
Cotton Textiles	35	50
Hosiery, full-fashioned	73	70*
Hosiery, seamless	68	

*It will be noted that the percentage for the

¹"Supplementary Wage Practices in American Industry," op. cit., p. 7.

²"Proportions of Pieceworkers in the Last Pay-Week in October, 1949," op. cit., p. 86.

<u>Branch</u>	<u>United States</u>	<u>Great Britain</u>
Woolen and Worsted Textiles	34	42
Rayon and Silk Textiles	35	40
Textile Finishing	22	46

United States hosiery industry is broken down into full-fashioned and seamless, while for Great Britain the figure is given for the hosiery industry as a whole.

CHAPTER X

SUMMARY OF CONCLUSIONS

"The existence of an incentive problem is a measure of our failure to make productive work the direct source of happiness rather than the indirect means by which a man buys it."¹ Because of this situation, industry is constantly confronted with the task of finding what the workman wants from life.

When the writer recently asked a librarian for a book entitled Why Men Work, she took it from the shelf with the comment, "I can think of only one reason, and that is for the money he receives." Conclusions reached in this thesis show that there are reasons other than the financial incentive, but this is undoubtedly the most important. A good proof of this is to take an informal stroll about the work floor and ask the workers what their greatest incentive is. The writer found that at least nine out of ten will say the size of the pay packet.

¹Nigel Balchin, "The Nature of Incentives," The Nineteenth Century, November, 1948, pp. 247-254.

In the dissertation, wage incentives have been treated as methods of compensating workers under which the relationship between work produced and wages earned is direct and immediate. However, in industry today it seems that the word incentive does not mean motivation, but it is looked upon as the money paid for a job. Industry has failed to look upon an incentive as an aim toward a higher standard of life; too often it is aimed toward the preservation of life.

The ultimate test of any wage incentive plan is the way it works. Such considerations as the effect on worker's health, morale, and long-time efficiency are of major importance when appraising a plan, but the most immediate measure of its success is its apparent effect upon production. It was concluded in earlier chapters that any wage incentive has a definite effect on productivity; examples have been given as proof of the good effect. However, it was necessary to qualify such conclusions by stating the difficulty arising when we try to limit the effect to the wage incentive alone, without taking other aspects of personnel relations into consideration. There is no doubt that, as a

general rule, the normal effort of workers in any walk of life is not more than 70 percent of what they could do if they really tried. Any properly executed program of incentive pay will undoubtedly induce the worker to surpass this effort to some extent.

Some general conclusions, most of them far from original, were drawn in pointing out reasons for a different outlook toward incentive payment in Great Britain and the United States. There are definite hindrances to incentives in both countries, but from all observations it seems that the American worker is favored when such payment is offered.

Income tax is a great barrier in both countries; but the percentage of the national income taken in taxes in Great Britain is more than twice as much as in the United States. Today Britain's tax structure is in line with her social policy. Suggestions can be made as to the easiest way of reducing this or that tax, but to reduce the tax demands of the Government would mean a reform of the policies which make such taxation necessary.

It was agreed that such factors as availability of consumer goods, mechanical help, size of the market, a labor surplus, and a lack of feeling that mass-production methods would damage the status and dignity of craftsmen, are all in favor of higher productivity in the United States. But a further conclusion was that American industry is more efficient than British industry simply because Americans are different from Britons. They live under industrial and social conditions so different that it would be ridiculous to expect the workers to have the same attitudes toward the day's work. Whether we want to admit it or not, a planned economy becomes so rigid that ordinary incentives to greater production almost cease to exist.

In America it seems that nothing is more important to the industrialist and the worker than a steadily increasing output for every man-hour. It is this spirit that makes American productivity great. The readiness of the worker to accept new machines, new methods, and the use of new materials is evident in American industry. British workers are still haunted by the fear of unemployment, thus making them suspicious

of new methods for speeding up production. The machine is looked upon as a rival and enemy instead of the ally that can execute a heavy load, hasten industrial processes, lower costs, and, in the end, create a greater demand.

The study shows that the oldest form of incentive payment--piecework--is still by far the most prevalent. Of the other specific plans outlined, very few still exist in their original form, but many modifications were found. Plans with elaborate and complicated formulas for computing payment are less common today than in the past.

Even though some discussion was given to details of the various plans in existence, conclusions should not be drawn to the effect that there is a perfect plan ready and waiting for any type of work, or to any industrial organization. In any given condition, it might be desirable to employ a modification of one plan, or a combination of two or more. The choice of a plan depends on conditions at hand. At one plant the workers might be little more than attendants at an automatic line operation, while at another plant, output

might depend entirely on the effort and skill of the worker. Individual problems of types of production, type of labor used, and the expense of installing the system have some bearing on the use of incentive payment in a given company.

With the exception of piece rates, it was found that every other major type of incentive payment is of American origin. It was not concluded that piecework originated in Great Britain, but evidence of lists appeared there sooner than in the United States. For example, the earliest list found was that of the master printers of London in 1785. Although it is argued by some British writers that Frederick W. Taylor might have gotten some ideas for his plan from an early innovation which made its way into the cotton spinning industry in Oldham (England), as early as 1876, it is generally agreed that the foundation of modern wage incentive plans and their techniques were laid by Taylor in the early 1880's.

All forms of payment eventually made their way to Britain in the original or modified forms. The premium bonus system originated in America, but popular

modifications grew in Britain in the Wier and Rowan systems. One writer¹ states that there is an important factor in favor of the straight piecework system in Britain, because the other types are of American origin, and the average British worker has a natural antipathy toward anything from across the Atlantic, the supposed home of the heartily despised and detested efficiency experts.

A conclusion has not been reached as to the plan most favored, but one definite conclusion is that an individual incentive plan is always preferable. In cases where it is necessary to use a group plan, the number in the group should be the smallest possible, compatible with the economic measurement of work done. The further the scheme gets away from paying individual effort, the less incentive there is for each man to do his very best. If the worker's effort is not related to his own earnings, then those who are inclined to be lazy will be supported by the industrious workers.

¹Hunt, op. cit., p. 319.

When the number in the group goes beyond twenty or twenty-five, the individual worker loses his identity in the mass, often resulting in the failure of the scheme.

Widespread use of wage incentive plans has aroused great interest in the growth of techniques such as job evaluation and time and motion study, for determining what constitutes "a fair day's work."

Job evaluation is the primary step and beginning function in a comprehensive program of wage structure. Any system of payment designed to offer a financial incentive to a worker in return for efficient work above a specified quantity, presupposes that the worker is being fairly and adequately paid for his efforts and output up to and including that specified amount.

Job evaluation is a highly objective process. No prejudice, preconception, or bias have any place in it. However, the complete process must be conducted with a keen regard for feelings, ambitions, and suspicions of employees, and it must have the complete cooperation of every employee in the plant. The procedure of job evaluation is systematic, but it cannot

be classified as a precise, infallible method of measurement, because the basis for the system is human judgment. But the process can be so refined that the error in such judgment is greatly reduced.

Of the four types of job evaluation, those based on some form of point system have enjoyed so much popularity that they make the use of other methods almost negligible. This was found true in both the United States and Great Britain. The writer found that job evaluation has advanced to a much further stage in the United States, but the subject is now receiving much discussion in Great Britain.

Time and motion study are very important to an investigation into wage incentives. Motion study is too often thought of as a tremendously involved method of measurement which can be conducted only by large companies with expanded facilities and ample capital. The fact should be stressed that motion study is simply the analysis of a job with view of reducing it to its simplest accomplishments.

After finding the most economical way of doing the job, the first step of time study is an easy matter. The observing of an employee at work and the determination of the actual time taken to perform a specified task requires only the reading of a stop watch. The difficulty arises when determining the time required if the task were performed at the normal pace of a fair day's work. The most difficult steps in setting the time standard come when making allowances for speed, effort, fatigue, and delay factors.

Today there is scarcely a type of industrial activity that someone has not successfully measured with promising results. It was concluded that if the existence of any job, task or function is justified, then it must have a purpose or objective. Better performance of this purpose, or closer attainment of this objective must be worth money to the employer. Therefore, it seems quite feasible that some yardstick could be devised to measure this better performance or closer attainment.

Once it has been agreed that a certain amount of effort is a fair effort and merits a given wage,

anything over and above the agreed figure warrants additional reward. If management concludes today that X is a fair day's work, it certainly is not correct to decide next week that a fair day's work is $X + Y$. Once a rate is established, any increase in efficiency justifies a higher reward.

In some cases the bonus earnings are consistent enough to lead one to believe that they are quite accurate, but often this consistency is due largely to the worker. The operatives know that they are expected to earn a certain bonus, and, consciously or unconsciously, they work at a rate which will approximate to it. This conclusion is in agreement with the writer who made the statement that time study men have to be thankful to the worker for clinging to this idea. If he did not, time study and time standards would not show up so well.

The task of installing a successful incentive scheme is one of the most difficult and complex problems in the field of management. Before the introduction of a plan, every aspect of production tooling, layout, servicing, et cetera, should be improved to highest

efficiency. Before introducing payment by results, the industrialist should be sure that 100 percent efficiency has been attained in production methods. Then if he desires 105 percent efficiency, he may consider an incentive scheme.

The most important factor in the success of any payment plan is a clear understanding by employees, and, at the same time, gaining their confidence that it will be fairly administered. If the employees are represented by a union, their representatives should be fully and continually informed as to the methods and procedures used, and of the objective to be accomplished. Labor and management must be in complete agreement regarding the adoption of the plan.

"Give workers as a formally organized group a say-so in setting wage rates, work standards, job evaluation, and in making time and motion studies, and they will produce all they can within the limitations of physical endurance, health, and fatigue; deny workers such a say-so and they will engage in restrictive

practices out of self-protection."¹

The scheme should be sufficiently simple to be thoroughly understood by all employees. Workers should be able to calculate the effect of their efforts on their earnings. Once an incentive plan has been installed, it should not be altered in any way except by mutual agreement between the company and the representatives of its employees. If management alters the plan, the confidence and cooperation of the workers is immediately lost. This is undoubtedly the main reason for much of the ill feeling toward incentive pay today.

Attitudes toward wage incentive plans change in the course of time from favor to disfavor, or vice versa, according to the situation at hand. At the present time, the governments of both countries are in full accord with payment by results. This fact was greatly stressed in the United States during the war years, when the Government helped to install such

¹Clinton Golden and Harold J. Rutenberg, The Dynamics of Industrial Democracy (New York: Harper & Brothers, 1942), p. 183.

payment at every plant where a satisfactory scheme could be compiled. With wages still controlled in Great Britain, greater and greater interest has been shown toward incentive payment to every possible worker. In Britain at the moment, an ambitious attempt to get a wide use of bonus plans is being made in one of the most complex of all trades--building. Here the argument seems to be simply, "If you can estimate for the job you can bonus it." Most builders have a good idea of what a job is going to cost and are being encouraged to tell the men that if the job is done for less than the estimate, half the difference is theirs. Such schemes as this have been initiated at the request of the Government.

It was found that there is a wide divergence in opinion among the different unions on the subject of timework and piecework, but such a division does not necessarily mean that there is a clash between employers and unions on the subject. In most cases where the union prefers piecework, the employer also prefers it. And in the great majority of the cases the same is true with timework. In the industries where piecework is the

general and traditional method of payment, it seems that there is very little opposition.

In most industries where the unions of one country approved payment by results, the unions of the other country were in accord. For instance, the major unions of the steel industries in both the United States and Great Britain expressed an attitude of favor. The same was true with the rubber industry, the glass industry, the textile industry, and the pottery industry. In the automobile industry the fact is well known that in the United States the shift to day rates now covers most of the industry. One of the first demands of the United Automobile Workers Union was for the abandonment of incentive wages. In Great Britain it seems that the unions are still very much in favor of payment by results.

In Great Britain incentive payment is gaining favor in the building industry, where more and more plans are being introduced. In the United States, there is still a feeling of disfavor with most building workers and their unions.

The printing industries of both countries have been quite hesitant in expressing favor toward payment by results. An executive of one union in Great Britain stated that for many years the union was traditionally opposed to any form of payment by results, but that such an attitude had been modified in the interest of national economy. In the United States the policy is one of disfavor. A very small percentage of printing workers are employed under incentive pay.

The basis for much of the worker's fear and suspicion of wage incentive plans is his objection to a purely "scientific" approach to his job. Workers claim that almost any job contains elements which cannot be evaluated by the stop-watch technique. Workers feel that they are being treated as something abstract, rather than human beings at work. This feeling is accentuated when engineers break down jobs into repetitive operations, study work methods to discover short cuts, shorten the cycle of operations which each worker is allowed to perform, and emphasize financial reward instead of creative workmanship as an incentive to efficient production. It is hard for the average workman

to understand how an engineer with no working experience on the job can have any first-hand familiarity with the job being investigated. Such "scientific" study is looked upon with suspicion and distrust.

Perhaps the strongest objection to wage incentives is the fear of unemployment. Operatives think that the resulting increased productivity will cause fewer jobs, and so contribute to unemployment. The basic solution to this problem should be education. Workers must be taught that wage incentives are one of the major factors that have encouraged increased individual effort, resulting in improved over-all plant efficiency which, in turn, lowers the cost of the product to the customer, thus creating a greater demand for the product, and thereby making more and more jobs available.

This conclusion is in full agreement with the statement made by Herbert S. Morrison, Lord President of the Council, on November 6, 1949, in Lanchashire. It was wrong, Mr. Morrison said, to condemn those workers who set "too fast a pace for their less efficient work-mates" as traitors to their class and the labor movement. "Workers who work harder and earn more than the minimum

are not only not injuring their fellows, but are helping and supporting them."

There is no doubt that restrictive traditions were born largely from painful memories of the pre-war depression years. The restriction of output does not necessarily denote worker inefficiency, nor does it signify poor management.

A careful study of almost any job will reveal that restrictive practices in some form exist in practically every plant, on all kinds of jobs, and under all types of wage payment plans. The practice is so common that most experienced workers take it for granted. The writer does not contend that all workers restrict their output, but it is definitely one of the major problems of industry.

In making comparisons of the use of wage incentives in selected industries, it was interesting to find that the extensiveness in a certain industry in one country was usually reflected in the use in the other country. In the building and printing industries it was found that there is only a slight use in both countries. However, the rapid growth of incentive

schemes in the building industry in Britain gives some indication that the percentage of builders on incentive pay will soon surpass the number in the United States.

In contrast to the almost complete absence of incentive wage systems in printing and building, such industries as pottery, rubber, textiles, and the metal industries enjoy widespread use of such plans in both countries. The percentage of total workers under payment by results in these industries is probably greater in the United States. This is especially true in the glass and rubber industries. However, the textile industry, long characterized as the piece-rate industry, indicates about equal extensiveness of use of payment by results.

Because of the change of attitude in the automobile industry of the United States it can be concluded that much fewer than half the workers are on incentive pay. The percentage might go as low as one-fourth of all workers. At the same time it appears that the percentage in Great Britain might be as high as 60 percent for the industry as a whole.

In the coal mining industry it was found that about one-fourth of the workers of both countries are paid by results.

After reaching the conclusion that a certain industry in one country has a more widespread use of wage incentive plans than does the same industry in the other country, it might be expected that a discussion should follow showing what effect this greater prevalence has on the productivity of the worker. Several attempts have been made to compare the productivity in selected industries in Great Britain and the United States, but the writer has concluded that no comparative figures are wholly accurate. Conclusions can be made to the effect that productivity is comparatively higher in one country, but it is impossible to point out the portion of the increased production due to the method of payment.

Those who have worked as industrial engineers during the installation of a sound incentive system have no doubt that production is increased. It has been a sheer delight to the writer to witness some of the results of standards he has installed. Making

comparisons of wages, costs, quality, and employee satisfaction after each standard was installed, has been convincing enough to leave little doubt as to the good effect on the productivity of the worker. There are those who argue that incentive payment has an adverse effect on production, but the writer must first see such a situation before it is believed. If all the prerequisites have been followed, and if the scheme has the confidence and cooperation of all concerned, the effect on production will surely be convincing.

A wage incentive plan, if properly applied, encourages workers to believe that their good work is meritorious and that it is recognized. Workers are discouraged when all men doing the same job are paid the same rate, regardless of how much or how little is produced and without giving recognition to variances in skill. A sound wage incentive policy can do what no machine, no apparatus, and no technique can accomplish, because its existence can inspire a purposeful attitude. Analysis has proved that nothing in the world can substitute for man's belief in himself, and it is the duty of management to do everything in its power to further that belief.

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APPENDICES

APPENDIX A

INCOME TAX SCHEDULES FOR THE UNITED STATES

FOR PERSONS WITH INCOMES UNDER \$5,000 NOT COMPUTING TAX ON PAGE 3

Read down the shaded columns below until you find the line covering the total income you entered in item 6, page 1. Then read across to the column headed by the number corresponding to the number of exemptions claimed in item 1, page 1. Enter the tax you find there in item 7, page 1.

If total income in item 6, page 1, is—		And the number of exemptions claimed in item 1, page 1, is—				If total income in item 6, page 1, is—		And the number of exemptions claimed in item 1, page 1, is—									
least	But less than	1	2	3	4 or more	At least	But less than	1	2	3	4	5	6	7	8 or more		
Your tax is—						Your tax is—											
\$0	\$675	\$0	\$0	\$0	\$0	\$2,325	\$2,350	\$250	\$150	\$150	\$50	\$50	\$0	\$0	\$0	\$0	\$0
675	700	3	0	0	0	2,350	2,375	253	154	154	54	54	0	0	0	0	0
700	725	7	0	0	0	2,375	2,400	257	157	157	58	58	0	0	0	0	0
725	750	11	0	0	0	2,400	2,425	261	161	161	62	62	0	0	0	0	0
750	775	14	0	0	0	2,425	2,450	265	165	165	65	65	0	0	0	0	0
775	800	18	0	0	0	2,450	2,475	268	169	169	69	69	0	0	0	0	0
800	825	22	0	0	0	2,475	2,500	272	172	172	73	73	0	0	0	0	0
825	850	26	0	0	0	2,500	2,525	276	176	176	77	77	0	0	0	0	0
850	875	29	0	0	0	2,525	2,550	280	180	180	80	80	0	0	0	0	0
875	900	33	0	0	0	2,550	2,575	283	184	184	84	84	0	0	0	0	0
900	925	37	0	0	0	2,575	2,600	287	187	187	88	88	0	0	0	0	0
925	950	40	0	0	0	2,600	2,625	291	191	191	92	92	0	0	0	0	0
950	975	44	0	0	0	2,625	2,650	294	195	195	95	95	0	0	0	0	0
975	1,000	48	0	0	0	2,650	2,675	298	199	199	99	99	0	0	0	0	0
1,000	1,025	52	0	0	0	2,675	2,700	302	202	202	103	103	3	0	0	0	0
1,025	1,050	55	0	0	0	2,700	2,725	306	206	206	106	106	7	0	0	0	0
1,050	1,075	59	0	0	0	2,725	2,750	309	210	210	110	110	11	0	0	0	0
1,075	1,100	63	0	0	0	2,750	2,775	313	214	214	114	114	14	0	0	0	0
1,100	1,125	67	0	0	0	2,775	2,800	317	217	217	118	118	18	0	0	0	0
1,125	1,150	70	0	0	0	2,800	2,825	321	221	221	121	121	22	0	0	0	0
1,150	1,175	74	0	0	0	2,825	2,850	324	225	225	125	125	26	0	0	0	0
1,175	1,200	78	0	0	0	2,850	2,875	328	228	228	129	129	29	0	0	0	0
1,200	1,225	82	0	0	0	2,875	2,900	332	232	232	133	133	33	0	0	0	0
1,225	1,250	85	0	0	0	2,900	2,925	336	236	236	136	136	37	0	0	0	0
1,250	1,275	89	0	0	0	2,925	2,950	340	240	240	140	140	40	0	0	0	0
1,275	1,300	93	0	0	0	2,950	2,975	345	243	243	144	144	44	0	0	0	0
1,300	1,325	96	0	0	0	2,975	3,000	349	247	247	148	148	48	0	0	0	0
1,325	1,350	100	1	0	0	3,000	3,050	356	253	253	153	153	54	0	0	0	0
1,350	1,375	104	4	0	0	3,050	3,100	364	260	260	161	161	61	0	0	0	0
1,375	1,400	108	8	0	0	3,100	3,150	373	268	268	168	168	68	0	0	0	0
1,400	1,425	111	12	0	0	3,150	3,200	382	275	275	176	176	76	0	0	0	0
1,425	1,450	115	16	0	0	3,200	3,250	391	283	283	183	183	83	0	0	0	0
1,450	1,475	119	19	0	0	3,250	3,300	399	290	290	190	190	91	0	0	0	0
1,475	1,500	123	23	0	0	3,300	3,350	408	298	298	198	198	98	0	0	0	0
1,500	1,525	126	27	0	0	3,350	3,400	417	305	305	205	205	106	6	0	0	0
1,525	1,550	130	31	0	0	3,400	3,450	425	312	312	213	213	113	14	0	0	0
1,550	1,575	134	34	0	0	3,450	3,500	434	320	320	220	220	121	21	0	0	0
1,575	1,600	138	38	0	0	3,500	3,550	443	327	327	228	228	128	29	0	0	0
1,600	1,625	141	42	0	0	3,550	3,600	452	335	335	235	235	136	36	0	0	0
1,625	1,650	145	45	0	0	3,600	3,650	460	344	344	243	243	143	44	0	0	0
1,650	1,675	149	49	0	0	3,650	3,700	469	353	353	250	250	151	51	0	0	0
1,675	1,700	153	53	0	0	3,700	3,750	478	362	357	258	258	158	59	0	0	0
1,700	1,725	156	57	0	0	3,750	3,800	486	370	365	265	265	166	66	0	0	0
1,725	1,750	160	60	0	0	3,800	3,850	495	379	372	273	273	173	73	0	0	0
1,750	1,775	164	64	0	0	3,850	3,900	504	388	380	280	280	181	81	0	0	0
1,775	1,800	167	68	0	0	3,900	3,950	513	396	387	288	288	188	88	0	0	0
1,800	1,825	171	72	0	0	3,950	4,000	521	405	395	295	295	195	96	0	0	0
1,825	1,850	175	75	0	0	4,000	4,050	530	414	402	303	303	203	103	4	0	0
1,850	1,875	179	79	0	0	4,050	4,100	539	423	410	310	310	210	111	11	0	0
1,875	1,900	182	83	0	0	4,100	4,150	547	431	417	317	317	218	118	19	0	0
1,900	1,925	186	87	0	0	4,150	4,200	556	440	425	325	325	225	126	26	0	0
1,925	1,950	190	90	0	0	4,200	4,250	565	449	432	332	332	233	133	34	0	0
1,950	1,975	194	94	0	0	4,250	4,300	574	457	439	341	340	240	141	41	0	0
1,975	2,000	197	98	0	0	4,300	4,350	582	466	447	350	347	248	148	49	0	0
2,000	2,025	201	101	2	0	4,350	4,400	591	475	454	359	355	255	156	56	0	0
2,025	2,050	205	105	6	0	4,400	4,450	600	483	462	367	362	263	163	63	0	0
2,050	2,075	209	109	9	0	4,450	4,500	608	492	469	376	370	270	171	71	0	0
2,075	2,100	212	113	13	0	4,500	4,550	617	501	477	385	377	278	178	78	0	0
2,100	2,125	216	116	17	0	4,550	4,600	626	510	484	393	385	285	186	86	0	0
2,125	2,150	220	120	21	0	4,600	4,650	635	518	492	402	392	293	193	93	0	0
2,150	2,175	223	124	24	0	4,650	4,700	643	527	499	411	400	300	200	101	1	0
2,175	2,200	227	128	28	0	4,700	4,750	652	536	507	420	407	308	208	108	9	0
2,200	2,225	231	131	32	0	4,750	4,800	661	544	514	428	415	315	215	116	16	0
2,225	2,250	235	135	35	0	4,800	4,850	669	553	522	437	422	322	223	123	24	0
2,250	2,275	238	139	39	0	4,850	4,900	678	562	529	446	430	330	230	131	31	0
2,275	2,300	242	143	43	0	4,900	4,950	687	571	537	454	437	337	238	138	39	0
2,300	2,325	246	146	47	0	4,950	5,000	695	579	544	463	444	345	245	146	46	0

APPENDIX B
STANDARD TIMES FOR JANITORS

STANDARD TIMES FOR JANITORS

FACTORY AREA--MANUAL SWEEPING--WOODEN FLOORS (Base Allowances in Minutes)

CODE - 1st Letter (L,M,H) covers light, medium or heavy degree of trash accumulation.
2nd Letter covers light, medium or heavy density of floor installations.

Floor Area in Square Feet	LL	LM	LH	ML	MM	MH	HL	LM	HH
500	10	11	12	12	13	14	14	15	16
1000	20	21	23	24	26	27	28	30	31
1500	30	32	35	36	39	41	42	45	47
2000	40	42	46	48	52	54	56	60	62
2500	50	53	58	60	65	68	70	75	78
3000	60	63	69	72	78	81	84	90	93
3500	70	74	81	84	91	95	98	105	109
4000	80	84	92	96	104	108	112	120	124
5000	100	105	115	120	130	135	140	150	155
6000	120	126	138	144	156	162	168	180	186
7000	140	147	161	168	182	189	196	210	217
8000	160	168	184	192	208	216	224	240	248
9000	180	189	207	216	234	243	252	270	279
10000	200	210	230	240	260	270	280	300	310

STANDARD TIMES FOR JANITORS (continued)

Cleaning Operations

(Base Allowances in Minutes)

Item or Operation	Area in Square Feet										
	50	100	150	200	250	300	350	400	450	500	
1. Sweep Floor (Open Area)	2	2	3	4	5	6	7	8	9	10	
2. Sweep Stairs (1 Ft. Wide)	5	6	9	12	15	18	21	24	27	30	
3. Wax & Buff Floors	5	6	8	11	13	16	18	21	23	26	
4. Dry Mop- Concrete, Wood or Tile Floor	3	3	4	5	6	7	8	9	10	11	
5. Wet Mop Con- crete	5	6	8	11	13	16	18	21	23	26	
6. Wet Mop-Wood & Tile	2	2	3	4	5	6	7	8	9	10	
7. Sweep & Wet Mop Concrete	7	8	12	15	19	22	26	29	33	36	
8. Sweep & Wet Mop--Wood or Tile	4	4	6	8	10	12	14	16	18	20	
9. Vacuum Rugs	4	5	7	9	11	13	15	17	19	21	

STANDARD TIMES FOR JANITORS (continued)

Cleaning Operations (continued)

Number of Units										
	1	2	3	4	5	6	7	8	9	10
Wash Basins) Add 5 minutes per rest	5	8	12	15	19	22	26	29	33	36
) room for each 100										
Toilet Bowls) square feet for	3	6	8	11	13	16	18	21	23	26
) miscellaneous cleaning,										
) dispensing service,	2	3	4	5	6	7	8	9	10	11
) etc.										
Mirrors)	3	5	7	9	11	13				
Drinking Fountain	7									
Windows (42 x 76"--Wash Inside Only)	9	18	27	36	45	54	63	72	81	90
Venetian Blinds (42 x 76"--Wash)	31	61	91	121	151	181	211	241	271	301
Venetian Blinds--Dust	12	24	35	46	57	68	79	90	101	112
Venetian Blinds--Vacuum	11	21	31	41	51	61	71	81	91	101
Office Cleaning--Per desk or table	5	8	12	15	19	22	26	29	33	36
Desk Top--Wash	6	12	18	24	30	36	42	48	54	60
Desk Top--Clean and Dust	3	5	7	9	11	13	15	17	19	21
Desk Top--Wax	4	8	12	16	20	24	28	32	36	40

STANDARD TIMES FOR JANITORS (continued)

Cleaning Operations

(Base Allowances in Minutes)

Item or Operation	Area in Square Feet										
	550	600	650	700	750	800	850	900	950	1,000	
1. Sweep Floor (Open Area)	11	12	13	14	14	16	17	18	19	20	
2. Sweep Stairs (1 Ft. Wide)	33	36	39	42	45	--	--	--	--	--	
3. Wax & Buff Floors	28	31	33	36	38	41	43	46	48	51	
4. Dry Mop- Concrete, Wood or Tile Floor	12	13	14	15	16	--	--	--	--	--	
5. Wet Mop Concrete	28	31	33	36	38	41	43	46	48	51	
6. Wet Mop-Wood & Tile	11	12	13	14	15	16	17	18	19	20	
7. Sweep & Wet Mop Concrete	40	43	47	50	54	57	61	64	68	71	
8. Sweep & Wet Mop--Wood or Tile	22	24	26	28	30	32	34	36	38	40	
9. Vacuum Rugs	23	25	27	29	31	33	35	37	39	41	

APPENDIX C
MERIT RATING

Merit Rating

Merit rating is a system for discovery and classification of the individual differences among employees-- a tool for appraising the relative qualities of the personality of the worker with respect to the job he fills. The aims of merit rating are (1) to increase production, (2) to aid in the establishment of a fair rate of pay for a fair day's work, (3) to create better understanding between management and the laboring force, and (4) to uncover special abilities of the employees.

In an effort to increase production, a good merit rating system creates a spirit of competition among the employees. It offers an incentive for superior achievement. If the employee knows that there is a sound system in use which gives management a fair evaluation of his services, he will strive to do his best. At the same time, if employees know that their efforts are unknown to management, they are very likely to lose an essential interest in their jobs.

Merit rating and job evaluation go hand in hand when determining the amount of money a worker should be

paid. While job evaluation is the analysis of the job itself to learn what is required of the person filling it, merit rating appraises the value of the worker doing the job. Merit rating does not aid in the establishment of the actual wage rate; that is done by job evaluation. From job evaluation studies, a rate for welders might be set from 2s. 6d. per hour to 3s. 2d. per hour. The workers often reach their successive levels within this range by a system of merit rating.

Perhaps the first formal rating plan to be used in industry is credited to Robert Owen (1771-1858), a cotton mill owner in New Lanark, Scotland. Owen developed a character book and character blocks to rate each of his employees. The daily production of the worker was recorded in the character book, and the character blocks, which represented the evaluation of the employee--from bad to excellent, were placed at the working place of the worker each day. Each of the six sides of the character block was a different color, each color representing a degree of value. Under the scheme, the worker and all his working mates could see the rating by viewing the side of the block which faced upward on

the bench. Owen was far ahead of his time because no widespread interests were shown in formal rating systems until many years later.¹

Since Owen's time several rating plans have been designed. Such plans can generally be classified into four broad groups: (1) ranking, (2) man-to-man comparisons, (3) check lists, and (4) scales. Detailed explanations of the plans are beyond the scope of this dissertation; however, the included merit rating forms, one for supervisory and the other for non-supervisory jobs, will serve as examples of the process. The included numerical scale shows the values given for each check space on the form for supervisory employees. The total number of points, the maximum being 100, serve as the final rating of the employee.

The score of each employee can assist management in making possible a fair and equitable wage, because all employees are judged in terms of the same specific factors and characteristics. The ratings are

¹R. C. Smyth and M. J. Murphy, Job Evaluation and Employee Rating (New York: McGraw-Hill Book Company, Inc., 1946), p. 174.

comparable because they are reduced to numerical values. This rating of performance for the payment of the worker is the only phase of merit rating relating to the subject of incentive payment, but there are many other uses which management can make of the employee scorings. They can be used to discover various abilities and characteristics of the employee. Transfers, promotions, demotions, discharges, and lay-offs during slack periods can be decided from information obtained from the ratings.

Merit rating programs are best developed on the individual firm basis. Existing plans seldom fit the needs of a particular firm. A recent study¹ concluded that the greatest weakness in merit rating is that a great number of organizations fail to use rating forms which exactly meet their needs.

¹"An Analysis of Industrial Merit Rating," unpublished bachelor thesis submitted by Robert Kenneth Vann, University of Tennessee, February, 1950, p. 52.

MERIT RATING REPORT FOR EMPLOYEES

SUPERVISORY

NAME _____ DEPT. _____

CLASSIFIED AS _____ ON _____

RATED BY _____ DATE _____

QUALITY OF WORK	() () Exceptionally good work. Minimum waste.	() () Better than average. Little waste.	() () Meets normal standards.	() () Work usually passable.	() () Frequent errors careless, wasteful.
PRODUCED	() () Extremely fast.	() () Faster than average.	() () Average speed.	() () Slower than average.	() () Painfully slow.
OBEDIENT FOLLOWING INSTRUCTIONS	() () Extremely dependable. No follow up.	() () Dependable on all instructions.	() () Dependable on routine instructions.	() () Not always dependable.	() () Not dependable.
COOPERATION	() () Extremely cooperative.	() () Very good relationship with others.	() () Works well with others.	() () Cannot always be relied upon to cooperate.	() () Does not work well with others.
TEACHING ABILITY	() () Excellent.	() () Above Average.	() () Ability to explain routine tasks.	() () Slight.	() () None.
KNOWLEDGE OF WORK	() () Completely informed.	() () Good knowledge.	() () Operating knowledge.	() () Learning slowly.	() () Poorly informed.
ADAPTABILITY	() () Learns new duties quickly and easily.	() () Requires little instruc- tion on new work.	() () Requires reasonable in- struction on new work.	() () Requires detail instruc- tion on new work.	() () Slow to learn. Has di- culty with new work.
INITIATION	() () Does more than is expected.	() () Interested and diligent.	() () Average application.	() () Tendency towards indifference.	() () Indifferent and lazy.
JUDGMENT	() () Unusually fine. Rarely makes poor decision.	() () Above average.	() () Judgment sound most of the time.	() () Erratic, sometimes good, sometimes bad.	() () Frequently uses bad judgment.
INITIATIVE	() () Pushes work thru ON OWN initiative.	() () Needs little supervision.	() () Needs help and direc- tion in some cases.	() () Needs considerable supervision.	() () Must always be told what to do.

NUMERICAL SCALE FOR SCORING MERIT RATING REPORT
FOR SUPERVISORY EMPLOYEES

Quality of Work	30	27	24	21	18	15	12	9	6	3
Speed	30	27	24	21	18	15	12	9	6	3
Carrying Out Instructions	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Cooperation	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Supervisory Ability	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Knowledge of Work	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Adaptability	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Application	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Judgment	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$
Initiative	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$	3	$2\frac{1}{2}$	2	$1\frac{1}{2}$	1	$\frac{1}{2}$

The maximum rating that can be obtained by this form is 100.

MERIT RATING FORM
OFFICE EMPLOYEES
(NON-SUPERVISORY)

NAME _____ DATE OF RATING _____

DATE HIRED _____ JOB CLASSIFICATION _____

RECOMMENDATION _____

	A	B	C	D	E
ACCURACY	Decidedly Inaccurate ()	Frequent Mistakes ()	Passable Accuracy ()	Very Accurate ()	Highest Possible ()
SPEED	Painfully Slow ()	Slower Than Average ()	Average Speed ()	Above Average ()	Extremely Fast ()
KNOWLEDGE OF WORK	Poorly Informed ()	Learning Slowly ()	Operating Knowledge ()	Good Knowl- edge ()	Completely Informed ()
CARRYING OUT IN- STRUCTIONS	Not De- pendable ()	Not Always Dependable ()	Dependable on Routine Instructions ()	Dependable on all In- structions ()	Extremely Dependable No Follow- up ()
COOPERATION	Negative ()	Somewhat Lacking ()	Works well with Others ()	Very Good Relationship with Others ()	Extremely Cooperative ()
INITIATIVE	None ()	Rarely Shown ()	Average Amount ()	Above Average ()	Marked De- gree ()
SUPERVISORY ABILITY	None ()	Slight ()	Ability to Explain Rou- tine Tasks ()	Above Aver- age ()	Excellent ()
APPLICATION	Poor ()	Fair ()	Average ()	Good ()	Excellent ()

REMARKS _____

APPENDIX D

JOB DESCRIPTION AND JOB CLASSIFICATION FORMS

DEVON VALLEY
PARCEMENT

Department Rod Mill Standard Code (Appendix D, p. 1)
Division Finishing Standard Title Tester - Spark
Plant Title _____
Date Rev 11/7/46 Plant Code _____
Primary Function _____

To segregate various grades of mixed steels by applying spark tests.

TOOLS AND EQUIPMENT:

Portable hand grinder, spark test samples, pencil, notebook, etc.

MATERIALS:

Tests hot rolled rods prior to shipment.

SOURCE OF SUPERVISION:

Receives direction and specific instructions from Foreman or Inspection Supervisor.

FUNCTION EXERCISED:

None.

WORKING PROCEDURE:

Receives instructions and working data relative to material to be tested.

Operates portable hand grinder, applying abrasive wheel to surface of material to produce spark.

Notes color and appearance of spark pattern, and determines proper segregation of material, such as high or low carbon steels, alloys, etc.

Records results of spark testing operation.

APPENDIX E

**THE I.C.I. METHOD OF JOB APPRAISEMENT FOR
GENERAL WORKER JOBS**

METHOD

RATE THE JOB, NOT THE MAN.

Assess on the Acceptable Performance--not on the Ideal Performance.

1. Study the Job.
 - (a) Study description of job.
 - (b) Study Actual job.
Include recurring factors, though infrequent.
Exclude supervisory responsibilities.
 - (c) Check title.
2. Discuss the Study.
All assessors together with Plant Management.
3. Rank and Rate.
Each assessor separately.
Revise after a few hours.
4. Disclose and Discuss the Ratings.
With other assessors until arguments appreciated.
5. Revise the Ratings.
Each assessor individually.
6. Complete the Marking.
 - (a) Average the ratings for each mainhead.
 - (b) Apply the weightings.
 - (c) Total the marks.

MAINHEADS

A	B	C	D
Mental Characteristics	Physical Characteristics	Acquired Skills and Knowledge	Working Conditions
Good Memory	Muscular Strength	Education	Physical
Ability to Reason	Stamina	Training	Vibration
Speed of Reaction	Agility	Experience	Position
Even Temperament	Sensory Accuracy		Fumes/Smell
Co-operativeness			Dust/Dirt
Perseverance			Heat/Cold/Changes
Mechanical Sense			Wetness
Initiative			Clothing and Equipment
Disparate Attention			Poor Light Exposure
Ability to Visualise			Mental
Sense of Responsibility			Noise
			Height
			Below Ground
			Isolation
			Monotony
			Nervous Tension
			Accident Risk
			Disease Risk

DATUM LINES

Adult Male	Female and Juvenile
<p>Basic Labourer</p> <p>Sandbarrowing</p> <p>Floorsweeping</p> <p>Taking messages</p> <p>Reading a thermometer</p> <p>Recording simple figures</p>	<p>Except for Muscular Strength (Mainhead B) the same datum line is used as for male jobs.</p> <p>For Muscular Strength the datum line is the Female Trucker at 30 points below the Sandbarrower.</p>

APPENDIX F

**MANUAL FOR JOB CLASSIFICATION OF PRODUCTION
AND MAINTENANCE JOBS**

F O R
J O B C L A S S I F I C A T I O N
P R O D U C T I O N A N D M A I N T E N A N C E J O B S

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The method of Job Classification set forth in this manual is based upon an analysis of the relative worth of jobs in terms of basic factors of job content. The twelve factors to be considered are:

1. Pre-Employment Training
2. Employment Training and Experience
3. Mental Skill
4. Manual Skill
5. Responsibility for Materials
6. Responsibility for Tools and Equipment
7. Responsibility for Operation
8. Responsibility for Safety of Others
9. Mental Effort
10. Physical Effort
11. Surroundings
12. Hazards

The plan is designed for Production and Maintenance Jobs below the rank of foreman. It is not intended to classify jobs that are predominantly clerical in nature.

In all job classification work, it should be borne in mind that it is the occupation that is under consideration and not the individuals who work on the occupation.

Classification will be made on the basis of performance of a "Fair Day's Work," defined as follows:

Fair day's work is that amount of work that can be produced by a qualified employee when working at a normal pace and effectively utilizing his time where work is not restricted by process limitations."

Example. A normal pace is equivalent to a man walking, without load, on smooth, level ground at a rate of three (3) Miles per hour.

The importance of adequate descriptions of the jobs cannot be overstressed. Job Descriptions serve to record why a job was classified as it was and also to judge alleged changes in job content resulting from technological changes or from accumulations of minor changes.

Jobs are to be classified without regard to existing wage rates.

Jobs will be placed in the appropriate level in each factor by considering the specific requirements of each job, the description of each level, and the illustrations set forth.

Classification in each factor is made at or above a minimum requirement called "Base." The "Base" level is not given an absolute value in classes since only the relative ranking of jobs is to be determined by the plan.

No interpolation between levels is contemplated in the use of this plan. In the determination of the job class for a job use only the closest whole number. For example; if the decimal part of the number is .4 or less, drop the decimal part; if the decimal part is .5 or more, use the next higher whole number.

In the subsequent reclassification of a job due to change in job content, consider only those factors affected by the change. Move them into the next class only if the change in job content is at least one whole job class.

PRE-EMPLOYMENT TRAINING - 1

Consider the mentality required to absorb training and exercise judgment for the satisfactory performance of the job. This mentality may be the result of native intelligence, and schooling or self study.

CODE	THE JOB REQUIRES THE MENTALITY TO LEARN TO:	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	<p>Carry out simple verbal or simple written instructions necessary to the performance of a repetitive manual task, or a closely supervised non-repetitive task. Make out simple reports such as crane reports and production cards.</p> <p>Operate simple machines and make simple adjustments where adjustments are limited.</p> <p>Use measuring devices such as scales, rules, gauges, and charts in the performance of work where action to be taken is obvious.</p> <p>Operate powered mobile equipment performing simple tasks where little judgment is required.</p>	<p>Stocker O. H. Laborer Loader - Shipping</p> <p>Thread. Mach. Oper. Barb Wire Mach. Oper. Pipefitter Helper Ingot Buggy Operator</p>	Base
B	<p>Perform work of a non-repetitive or semi-repetitive nature where judgment is required to obtain results. Lead or direct three or more helpers in a variety of simple tasks.</p> <p>Exercise judgment in the operation of powered mobile equipment servicing a number of units or performing a variety of tasks.</p> <p>Set up and operate machines or processes requiring a variety of adjustments.</p> <p>Post detailed data to standard forms or write reports based on observation and judgment.</p>	<p>Pickler Stocker</p> <p>Keeper - B- Fce. Truck Driver</p> <p>Guide Setter - Bil Slitter Operator</p>	.3
C	<p>Make general repairs to equipment involving the knowledge of mechanical or electrical principles. Interpret detailed assembly and complex part drawings such as involved in performing tradesman's duties.</p> <p>Direct the operation of a complex production unit which determines size, shape, analysis, or physical property of the product.</p> <p>Plan complex work details and procedures to obtain desired results.</p>	<p>Millwright B. M.</p> <p>Machinist 'A' Heater - Hot Strip Tandem Mill Roller Moulder 'A'</p>	1.0

EMPLOYMENT TRAINING AND EXPERIENCE - 2

Consider the time required to learn how to do the job, producing work of acceptable quality and of sufficient quantity to justify continued employment. Consideration must be given to the necessary time spent on DIRECTLY RELATED work in addition to the necessary time spent on the job being classified. The total time should be based upon CONTINUOUS PROGRESS. The total time will generally be less than the elapsed time spent on the job and related jobs. The time an employee spends on the job due to lack of turnover on the job ahead will not be considered a part of the training time.

CODE	MONTHS TO BECOME PROFICIENT	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Up to and including 2 months	Laborer Stocker, O. H.	Base
B	3 to 6 months inclusive	Pipefitter Helper Chipper Cond.	.4
C	7 to 12 months inclusive	Strander - Bar Mill Craneman Hot Strip	.8
D	13 to 18 months inclusive	Keeper (Blast Fce.) Die Setter - Thd. Mch.	1.2
E	19 to 24 months inclusive	Speed Oper. - H. S.	1.6
F	25 to 30 months inclusive	Finisher - (Cont. Rod Mill) Millwright - B. M	2.0
G	31 to 36 months inclusive		2.4
H	37 to 48 months inclusive	Coremaker "A" Roller - Blooms Machinist "A"	3.2
J	49 months and over	Blower - Bess.	4.0

MENTAL SKILL - 3

Consider the Mental Ability, Job Knowledge, judgment and ingenuity required to visualize, reason through, and plan the details of a job without recourse to supervision.

CODE	JOB REQUIRES ABILITY TO:	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Perform simple, repetitive routine tasks. Do simple sorting. Make changes in routine only when closely directed.	Laborer Stocker O.H. Wharfman - C. P. Scrapman - Bil. Shr.	Base
B	Make minor changes in routine or sequence on repetitive jobs involving selection, positioning, and recognition of obvious defects or adjustments where tolerances are liberal.	Charger Bar Mill Wire Bundler Pipe Stenciler	1.0
C	Perform semiroutine job involving some variety of detail and requiring judgment. Sort Material according to size, weight or appearance.	Chipper - Cond. Bottom Maker S. P. Stitcher Oper. Assorter - Tin Plate Tractor Operator - Ram Craneman - H. S.	1.6
D	Reason through problems involving set-up and operation of moderately complex equipment. Use considerable judgment in operating equipment. Exercise considerable judgment in selecting and using materials, tools and equipment in construction, erection or maintenance work.	Slitter Operator Finisher - H. S. Charging Mach. Oper. O.H. Ore Bridge Oper. Carpenter "A" Bricklayer "A" Millwright - B.M.	2.2
E	Plan and direct the operation of a large complex production unit. Reason through and plan operating problems. Plan work detail from complex blue prints.	Tandem Mill Roller 1st Helper - O. H. Machinist "A" Boilermaker "A"	2.8
F	Analyze and plan complex non-repetitive tasks to be performed by skilled workmen.	Layout Man "A" (Development work)	3.5

Consider the Physical or Muscular ability and dexterity required in performing a given job including the use of tools, machines and equipment.

JOB REQUIRES ABILITY TO:	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
<p>Use ordinary or heavy tools such as, bars, wrenches, shovels, hooks, etc., for performing simple or rough tasks, or where dexterity and pace are not of particular importance.</p> <p>Operate simple on and off switches, valves and lever controls.</p> <p>Handle ordinary material manually.</p> <p>Use chain or cable slings for simple crane hooking.</p>	<p>Laborer</p> <p>Stocker O.H.</p> <p>Stock Unloader - B.F.</p> <p>Hand Stamper - B.M.</p> <p>Wharfman - C.P.</p>	Base
<p>Use large wrenches, sledges, hand tongs, and heavy tools at a normal pace for a variety of tasks.</p> <p>Use gauges and small tools in a routine manner.</p> <p>Use torch to perform rough cutting work.</p> <p>Operate variable controls, such as rheostats, and levers, to control movement of machines or passage of material through equipment where jogging, frequent regulation and precision of adjustment is required.</p> <p>Make simple adjustment and repairs to machines and equipment.</p> <p>Make set-ups to equipment where the use of tools and gauges is simple and routine.</p>	<p>Roll Setter - Cont. B.W.</p> <p>Keeper - Blast Fce.</p> <p>Pipefitter Helper</p> <p>Tractor Oper. - Ram</p> <p>Stitcher Oper.</p> <p>Barb Wire Mach. Oper.</p> <p>Nail Mach. Oper.</p> <p>Mill Shearman - Bar Mill</p> <p>Cut Off Mach. Oper. - Pipe</p>	.5
<p>Use several hand tools or tradesman's tools on assembly work, such as ladle lining, simple carpentry or pipe fitting or in making adjustments to machines or equipment where close tolerances are required.</p> <p>Perform simple gas or arc welding.</p> <p>Use hand-cutting torch to burn to precision layout.</p> <p>Set up and operate machine tools for routine facing, drilling, milling, etc.</p> <p>Manipulate controls of complex machines at a rapid pace involving a high degree of coordination.</p> <p>Perform manual tasks such as positioning, assembling, etc., at a steady pace where accuracy and dexterity of high degree are required.</p>	<p>Bricklayer "A"</p> <p>Armature Winder "A"</p> <p>Hi Mill Roller-Seamless</p> <p>Millwright - B. M.</p> <p>Charging Mach. Oper. O.H.</p> <p>Roller - Coil Temper Mill</p> <p>Wheel Roller</p>	1.0
<p>Use tradesman's tools in a wide variety of difficult tasks involving close tolerances.</p> <p>Forge complex shapes without resorting to dies or templates.</p> <p>Finish complex sand molds, cores, etc.</p>	Machinist "A"	1.5
<p>Perform difficult shaping or forming to close tolerances, where precise muscular control and delicate touch are involved, such as making and assembling very small parts, precision instrument repair, etc.</p>		2.0

RESPONSIBILITY FOR MATERIALS - 5

Consider the obligation imposed either by authority or the inherent nature of the job to prevent loss through damage to materials.

The responsibility exists only to the extent that it is controllable by the workman, that is, the damage is a direct result of an act of, or negligence of, the workman on the job.

Material is that which is actually worked on. It may not always be product, as the equipment worked on by maintenance workers is considered materials for those jobs. This factor covers in addition to product, processing materials such as fuels, acids, tempering oils, etc. On attendant jobs only the material handled or supplied such as oil, air, gas, water, etc., is to be considered as material for the job.

Both care required and the probable monetary loss are to be considered. The cost of error must be qualified by the probability of detection. Determine the factor level by the degree of care required for the particular element of the job causing the estimated damage. Credit the cost of error for the length of time that it would normally continue before detection, with a maximum of one turn of production.

In determining the loss, consider cost of repair or replacement and the salvage value. Use values of materials in round numbers, considered normal for the industry, rather than actual plant costs.

CODE	REQUIREMENT OF JOB TO:	BENCHMARK JOBS	COST UP TO AND INCL.	NUMERICAL CLASSIFICATION
A	Perform task where damage is not likely. Work with material difficult to damage	Manganese Wheeler Mill Janitor Laborer	Under \$ 50	Base
B	Use ordinary care to prevent damage. Handle material manually on or off units. Mechanically handle or transport material not easily damaged. Perform repetitive tasks with liberal tolerances and specifications.	Feeder - Open Anneal Craneman (Cond.) Pusher Oper. - C.P. Ingot Buggy Oper. Millwright Hlpr. (Oiler) - B.M. Baller (Pipe) Stopper Maker - O.H.	\$ 50 100 250 500 1000 Over 1000	.3 .4 .8 1.2 1.8 2.3
C	Use close attention for part of turn. Set up and operate a producing unit where cycle is long and specifications are partially obtained by mechanical control. Perform repetitive work where close attention is required only during checking of product for tolerances. Mechanically handle and transport material subject to damage from handling devices.	Mill Shearman-Bar Mill Guide Setter - Bil. Wire Drawer - Mach. Coupling Tap. Oper. Tractor Oper. - Ram. Craneman --H.S.	\$ 50 100 250 500 1000 1500 Over 1500	.5 .7 1.2 1.8 2.5 3.1 3.7
D	Use close attention for majority of turn. Set up and operate units having a variety of detail requiring frequent checking and adjusting to determine size, shape, finish or physical properties of product. Inspect and classify finished product. Perform tradesman's work requiring frequent checking and close tolerances.	1st Helper - O.H. Boiler Maker 'A' Assorter - Tin Plate Carpenter 'A' Roll Turner	\$ 50 100 250 500 1000 1500 2000 3000 Over 3000	.8 1.1 1.6 2.4 3.5 4.5 5.3 7.0 8.5
E	Use very close attention. Have responsibility for product on complex units requiring constant checking. Perform tradesman's work involving a high degree of precision or variety of detail	Tandem Mill Roller Blower (Bess.) Machinist 'A' Roller - Blooms Layout Man 'A' - Dev.	\$ 50 100 250 500 1000 1500 2000 3000 Over 3000	1.2 1.6 2.3 3.2 4.5 5.6 6.7 8.5 10.0

RESPONSIBILITY FOR TOOLS AND EQUIPMENT - 6

Consider the obligation imposed on the workman for attention and care to prevent damage to tools and equipment with which he is actually working or which come under his control. The degree of responsibility is determined by the probability and cost of damage which might occur at any one time.

Note: Equipment installed or repaired by maintenance workers is considered as material and is credited under "Responsibility for Material."

DE	JOB REQUIREMENTS	BENCHMARK JOBS	PROBABLE DAMAGE	NUMERICAL CLASSIFICATION
	Probability of damage is remote. Use simple hand tools or equipment. Use no tools or equipment.	Laborer Stocker - O.H. Assorter - Tin Plate		Base
	Some Attention and Care Required to: Recognize obvious trouble and shut down routine machines and power hand tools to prevent or minimize damage. Use tools which are subject to damage such as micrometers, calipers, gauges, etc.	Chipper - Cond. Blacksmith 'A' Motor Inspector - B.M.	Low Med. High	.2 .3 .5
	Moderate Attention and Care Required to: Prevent damage to dies, power driven cutting tools and rolls while processing materials. Prevent damage to individual machines or moderately sized production lines while making set ups. Prevent damage to light mobile equipment such as tractor, trucks and light cranes.	Stitcher Oper. Truck Driver Blowing Engineer - B.F.	Low Med. High	.4 .7 1.0
	Close Attention and Care Required to: Prevent damage to complex high speed machines and production lines Prevent damage to heavy duty mobile equipment such as locomotive cranes and heavy duty cranes.	Craneman, Soak, Pit Ore Bridge Oper.	Low Med. High	.7 1.5 2.0
	Sustained High Degree of Care and Attention Required to: Prevent damage to expensive equipment where responsibility is placed on the operator and not entirely on automatic devices. Control rapidly changing conditions which require immediate action to avoid damage.	Heater - H. S. 1st Helper - O. H.	Low Med. High	1.0 2.0 3.0
	Extreme Care Required to: Prevent damage to equipment where responsibility exists for acts of others as well as own acts on large and complex operating units. Prevent damage to equipment where expert judgment and fast and accurate reaction is required.	Roller - Bloom	Low Med. High	1.5 3.0 4.0

RESPONSIBILITY FOR OPERATIONS - 7

Consider the obligation imposed on the workman for utilizing capacity of equipment or process by maintenance of pace and machine speeds. This includes planning, instructing and directing the work of others.

Consider the size of crew and teamwork required, the importance and size of equipment and the degree of control exercised by the workman on the job.

Excess capacity and storage facilities between process operations are definite indicators for the lowering of the classification in this factor.

E	JOB REQUIREMENTS	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
	Little or no responsibility beyond use of own time. Work as member of a gang on simple work closely directed. Work on simple highly standardized jobs with little equipment or no other operations closely dependent.	Mill Janitor Laborer Wire Bundler Chipper - Cond.	Base
	Work as a member of the crew on a production unit performing simple routine work requiring some co-ordination with other members of the crew or with process to maintain production.	Charger - Pack Mill Feeder - Open Anneal Scrapman - Bil. Mill	.5
	Responsible for operating a small or individual processing unit where continuity of production is required. Perform tradesman's or shop maintenance work such as operations of complex machine tools. Handle material to and from processing units using mobile powered equipment such as cranes, and tractors. Perform auxiliary or service operations when closely associated with production units or processes.	Sand Mill Oper. Roll Turner - Shapes Bottom Maker - S. P. Wharfman - C. P. Welder 'A' Craneman - Machine Shop Tractor Oper. - Tier	1.0
	Operate a medium sized producing unit not closely tied in with other operations; has several helpers. Responsible for performing assigned maintenance work on large producing units. Responsible for continuity of operations on a number of small producing units.	Millwright - B. M. Motor Inspector - B.M. Die Setter - Thrd. Mach. Wire Drawer - Mach.	2.0
	Operate an important part of a major producing unit. Operate a medium sized producing unit when closely associated with other operations. Responsible for continuity of operation for a number of medium sized units.	Craneman - Soak Pit Pusher Oper. C.P. Bloom Shearman Speed Oper. - H.S.	3.0
	Has high responsibility for complex work planning to meet production schedules. Has high responsibility for continuity of operations of a large producing unit.	1st Helper - O.H.	4.0
	Sets pace and assumes joint responsibility with supervision for production of a large unit.	Welder - Butt Weld	5.0
	Has responsibility for maximum production from a major producing unit.	Roller - Blooms	6.0

Consider the degree of care required by the nature of the job and the surroundings in which it is performed to avoid or prevent injuries to other persons. Only the direct acts or negligence of the person performing the job should be considered. It is assumed that other workers are observing the safety rules, and that all safety devices for which the job is not directly responsible are in order.

CODE	CHARACTERISTICS OF JOB	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Little care required to prevent injury to others. Works in area or on machine where others are seldom exposed to hazards of the job. Performs work exposing one other person, such as, Helper, where likelihood and probable seriousness of accident is small.	Wharfman - C. P. Hand Stamper - B.M. Stopper Maker - O.H. Manganese Wheeler - Bess.	Base
B	Ordinary care and attention required to prevent injury to others. Occasional crane hooking. Coordinated gang or crew work where individual acts may injure others. Operate equipment where others are occasionally exposed.	Chipper - Cond. Roll Turner Hot Bed Oper. - Bil. Mill Coil Oper. - Rod Mill	.4
C	Considerable care and attention required to prevent injury to others. Ordinary crane hooking. Operate power driven mobile equipment where others are exposed but probability of accident is low. Handle inflammable liquids or gases where safeguards minimize the probability of fire or explosion.	Ore Bridge Oper. Speed Oper. - H. S. Tandem Mill Roller Agitator Oper. B. P.	.8
D	A sustained high degree of attention and care required to prevent injury to others. Crane hooking where difficult rigging is required. Operate power driven mobile equipment in congested area. Responsible for flow of electric power or steam or the operation of high pressure vessels where others are exposed to accidents. Control units or equipment handling or processing molten or explosive materials where other persons are exposed but probability of accident is low.	Craneman - Soak. Pit 1st Helper - O.H. Keeper - Blast Fce.	1.2
E	Extreme care and judgment required to prevent injury to others. Handle, control or transport highly inflammable explosive or molten material exposing other persons to serious injury.	Blower - Bess.	2.0

MENTAL EFFORT - 9

Consider the mental or visual concentration and attention required by the job for the performance of a fair day's work. Select that level which best describes the average degree of concentration and attention required throughout the turn.

CODE	JOB REQUIREMENTS	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Minimum mental application required for performing highly routine, simple, rough or closely directed work. Walk, clean up, use simple tools for rough work, handle crude materials, operate simple controls not requiring adjustment. Manually handle product off or on processing unit where little coordination with others or process is required.	Wharfman - C.P. Stocker, Scrap - O.H. Manganese Wheeler-Bess. Scrapman - Bil. Shr. Dryerman - B.P.	Base
B	Light mental or visual application required for performing work where there is some variety, but actions to be taken and decisions made are limited to few possibilities. Work requiring some coordination with others or process. Set up, regulate, adjust simple machines and processes; weigh and count product, record data, ordinary crane hooking. Do simple trades work, such as concrete finishing, connecting pipe, simple torch cutting, etc. Routine lubrication.	Stopper Maker - O.H. Bottom Maker - S.P. Hot Bed Oper. - Bil. Mill Stitcher Oper.	.5
C	Moderate mental or visual application required for performing manual work, machine operations, set-ups, inspection and adjustments which require frequent decisions to detect and adjust for variance from proper operation. Operate cranes and tractors in congested areas or involving considerable variety of movement. Perform tradesman's duties not involving close tolerances.	Saturator Oper. - B.P. Keeper, Blast Fce. Guide Setter - Bil. Craneman - H.S. Bricklayer - Maint. 'A'	1.0
D	Close mental or visual application required for performing tradesman's work involving close tolerances, or controlling machines and processes at rapid pace requiring close coordination or fine adjustment. Plan or direct fairly complex work methods or operations, which obtain size, shape, or physical qualities of product.	Charging Mach. Oper. - O.H. Finisher - H.S. Machinist 'A' Motor Inspector - B.M. 1st Helper - O.H.	1.5
E	High mental application required for planning difficult work methods and sequences to obtain size, shape or physical qualities of product. Extremely close visual attention to make fine adjustments required to control high speed operations, or to exercise very precise muscular control.	Blower - Bess. Roller - Blooms	2.5

PHYSICAL EFFORT - 10

Consider the muscular exertion required by the job for the performance of a fair day's work. Select that level which best describes the average degree of muscular exertion required throughout the turn.

CODE	JOB REQUIREMENTS	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Minimum physical exertion. Perform very light work such as sitting or standing for purposes of observations, and such work as very light assembly and adjustment. Plan and direct work. Weigh and record.	Speed Oper. - H.S.	Base
B	Light physical exertion. Use light hand tools and handle fairly light materials manually. Operate crane type controls, light valves. Operate truck or tractor. Sweep, clean up. Shovel light material.	Heater - C.P. Bloom Shearman Machinist 'A'	.3
C	Moderate physical exertion. Handle medium weight materials. Use a variety of medium sized hand tools for performing tradesman's work. Climb and work from ladders. Operate heavy controls and valves. Use light sledge.	Stopper Maker - O.H. Bricklayer 'A' Locomotive Craneman Scarfer - Cond. Laborer	.8
D	Heavy physical exertion. Use heavy tools and handle heavy materials manually. Shovel heavy material. Use pick, heavy bars. Operate heavy pneumatic tools.	Keeper - Blast Fce. Soak, Pit Bottom Maker Blacksmith 'A'	1.5
E	Extreme physical effort. Extremely heavy lifting, pushing or pulling.	Opener - Sheets Manganese Wheeler - Bess	2.5

SURROUNDINGS - II

Consider the general conditions under which the work is performed, other than hazard, and the extent to which these conditions make the job disagreeable.

Select the description from the table which best describes the average working conditions for the job.

WORK REQUIRES EXPOSURE TO:	BENCHMARK JOBS	NUMERICAL CLASSIFICATIONS
Inside machine shop or average factory type of building. Slightly dirty, noisy and not uniformly heated.	Machinist 'A' Sheet Bundler Slitter Operator	Base
Heat in summer due to proximity to furnaces or hot materials. Inside and outside conditions but not required to remain out in extreme weather. Outside weather conditions but protected part of time by roofs, pulpits or cabs. Continually dirty or greasy work, or exposure to wetness and some fumes and smoke.	Coil Oper. Rod Mill Pipefitter 'A' Ore Bridge Oper. Dryerman - B.P.	.4
All weather conditions where weather is severe. Exposed to considerable wetness, acids, fumes, dust, or glare necessitating the wearing of protective clothing or devices. Extreme conditions of dirt where man becomes covered with obnoxious dirt such as tar, paint, etc. Extreme heat for intervals but not for extended periods. Exposed to intense noise for extended periods.	Welder 'A' Keeper - Blast Fce. Nail Mach. Oper.	.8
Exposed to extreme heat of intense degree and for considerable time.	Craneman - Soak. Pit	1.6
Exposed to extreme heat approaching the point of endurance where relief from surroundings at regular intervals is a necessity.	Bottom Maker - S.P	3.0

HAZARDS - 12

Consider the probability and severity of injuries to which the workman is exposed, assuming that the workman is exercising reasonable care in observing safety regulations.

CODE	LIKELIHOOD AND NATURE OF INJURY	BENCHMARK JOBS	NUMERICAL CLASSIFICATION
A	Accident hazard low and usual injuries consist of minor cuts, bruises, and burns. Operate machines, machine tools, material handling equipment, or control movement of material when only occasionally exposed to moving machinery. Perform repetitive manual tasks, such as feeding or piling product or material.	Hot Bed Oper. - Bil. Mill Speed Oper. - H.S. Craneman - H.S. Blower - Bess. Mill Janitor Coupling Tap Oper.	Base
	Accident hazard moderate and probable injuries consist of severe cuts, bruises or fractures such as encountered when performing routine crane hooking, operating tractors and trucks; regularly adjusting moving machinery or product. Exposed to falls such as may occur when walking or climbing over bins, stock buggies and low scaffolds. Occasionally exposed to hot objects that may cause moderate burns. Exposed to flying objects such as chips and scale. Handle or work near caustic, inflammable or volatile liquids or gases. (Closed vessels or pipes).	Tractor Operator - Ram Tandem Mill Roller Nail Machine Oper. Stocker - O.H. Bricklayer 'A' Scarfer - Cond. Bottom Maker - S.P. Chipper - Cond. Saturator Oper. B.P. Dryerman - B.P. Laborer Pickler Loader - Batch	.4
	Exposed to burns from molten metal splashes. Regularly manipulate hot product with tongs or hooks. Handle or control caustic inflammable or volatile liquids. (Open vessels or handling containers). Exposed to falls such as might occur when working on high scaffolds, structures and roofs. Occasionally exposed to high voltage electricity. Exposed to severe injury from crane hooking where difficult rigging or lifting devices are involved. Perform heavy maintenance work involving climb-and rigging to repair, set up, or tear down equipment and mills. Climb on moving rolling stock.	Charging Mach. Oper. O.H. Strander - Bar Mill Hi Mill Plugger - Pipe seamless Agitator Oper. - B.P. Pipefitter 'A' Motor Inspector - B.M. Stock Unloader - B.F. Millwright - B.M.	.8
	Exposed to severe burns from handling, transporting or controlling the flow of molten metal.	Keeper - Blast Fce. 2nd Helper - O.H.	1.2
E	Frequent exposure to a hazard where failure to exercise extreme care and judgment might cause an accident which would result in total disability or a fatality.	High Tension Lineman	2.0

APPENDIX G

JOB STUDY

Job Study

Included in this Appendix are brief comments and examples of some of the tools required in the procedures of methods improvement, including process charts, motion study, and the procedures of time study leading to the establishment of incentive standards.

Process Charts. Detailed discussion of process charts is beyond the scope of this study, but examples are given of each of the principle types. The object of a process chart is to find a better sequence of work. The three principle types of charts, all of which have a special use, are (1) the flow process chart, (2) man and machine chart, and (3) the operation chart.



















The flow process chart can be defined as a detailed record of a process sequence or of operations within a process. A man and machine chart portrays the work a person does when working with a machine, the work of the machine being the controlling factor. It is used to help obtain better utilization of the machine. Then, an operation chart is a graphic means of portraying the work a person does when performing a job which takes place essentially at one location. It serves as one of the most useful motion and time study techniques.

FLOW TYPE OF PROCESS CHART

Handling Spring Assembly

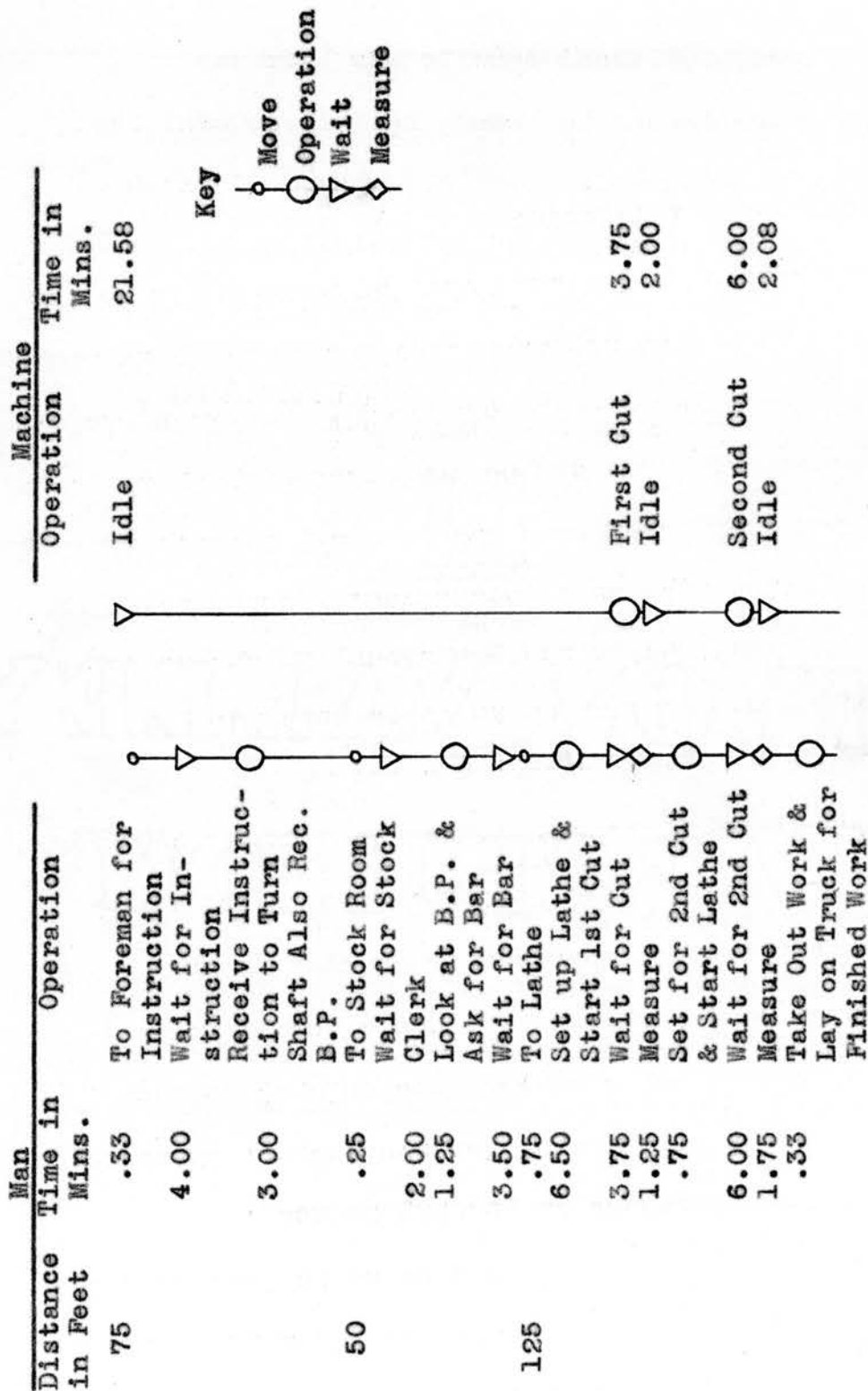
Present Method

Proposed Method

	Feet	Time Min.	Time Min.	Feet		
1  Springs inspected.					1  Springs inspected	
2  Springs loaded on truck.		2.00	2.00		2  Springs loaded on tray.	
3  Truck pushed to elevator.	50	1.00	.05	1	3  Tray on conveyor.	
4  Truck on elevator.		.30				
5  Up to 2nd floor.	20	.50				
6  Truck off elevator.		.30				
7  Truck to stock.	200	3.00	2.00	100	4  By conveyor to assembly room area. Unload and place in stock bins.	
8  Unload springs.		1.00	1.00		5 	
9  Temporary storage. Springs removed from stock to truck.		1.00			6  Temporary storage.	
10  Truck to assembly.	400	6.00				
11  Springs unloaded.		1.00	1.00	4	7  Tray springs removed from bins as needed.	
Totals	670	16.10	6.05	105		
Summary					Summary	
Feet travelled	670				Feet travelled	105
Time	16.10				Time	6.05

MAN AND MACHINE CHART

Turn Shaft on Lathe

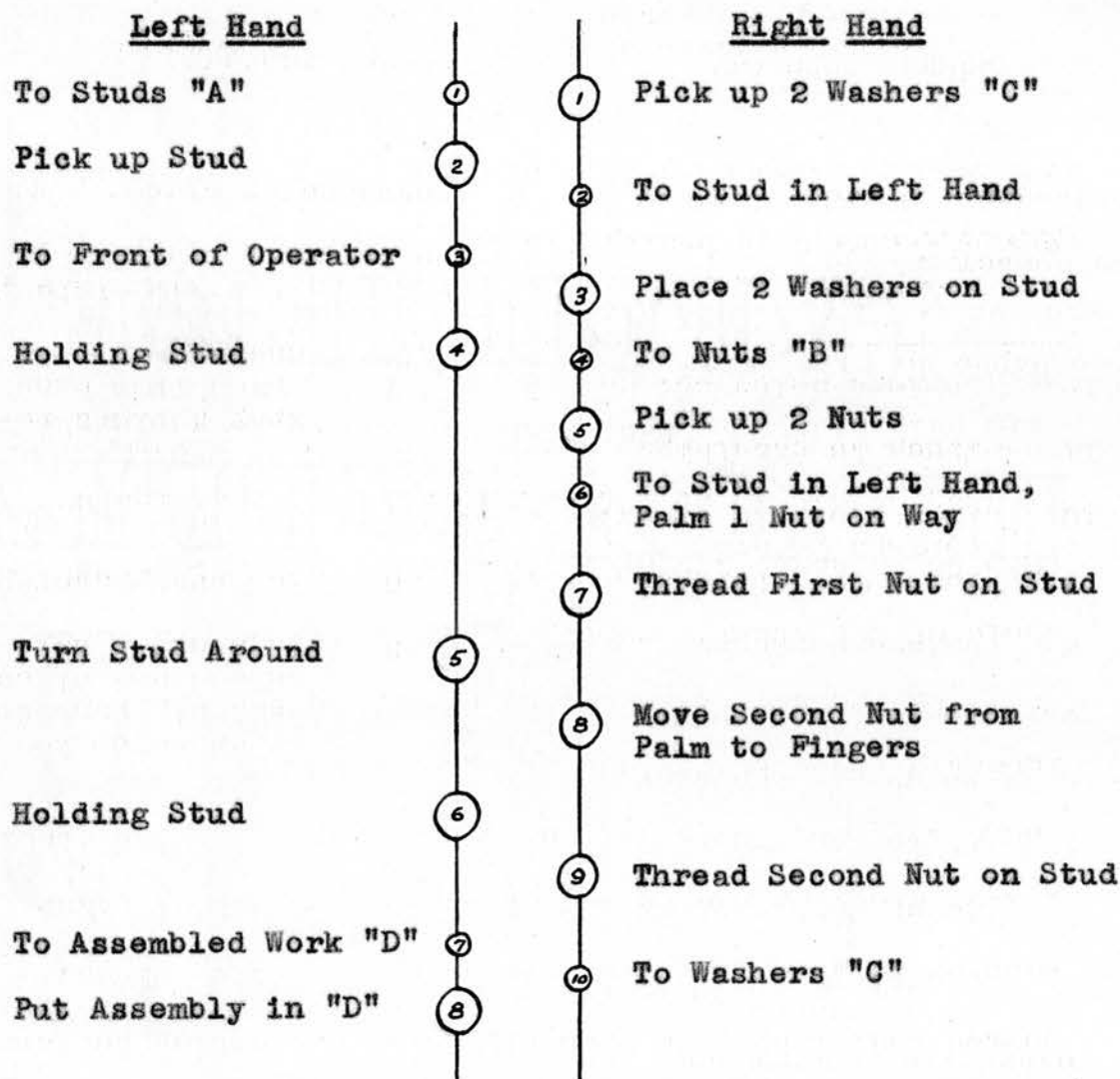


Summary

Man		Machine
Total Distance & Time	250 ft.-1.33 mins.	-
No. Operations	7	2
No. Moves	3	-
Total Time of Operations	14.83 mins.	9.75 mins.
Total Time Idle	19.25 mins.	25.66 mins.

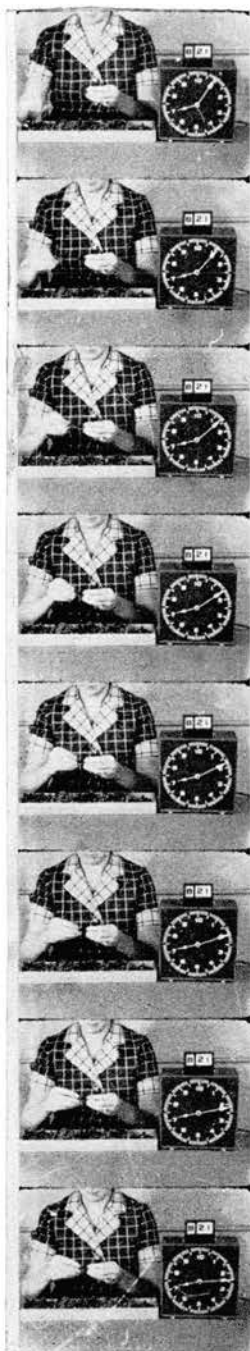
OPERATION CHART

Stud, Washer and Nut Assembly



Key

	LH	RH	SUM.
① Move	3	4	7
② Operation	5	6	11
	8	10	18
	-	3	3



Micromotion Study. Micromotion study is the name the Gilbreths gave to the method they developed in studying and measuring a worker's motions with the use of a motion picture and a microchronometer set up so as to show in the picture. The instrument accurately indicates the time intervals on the motion picture film. Such technique is necessary when measuring very small units--units which are too small to be measured with an ordinary stop watch. The technique was first made public at a meeting of the American Society of Mechanical Engineers in 1912.¹

The accompanying film strip shows the microchronometer being used for measurement.

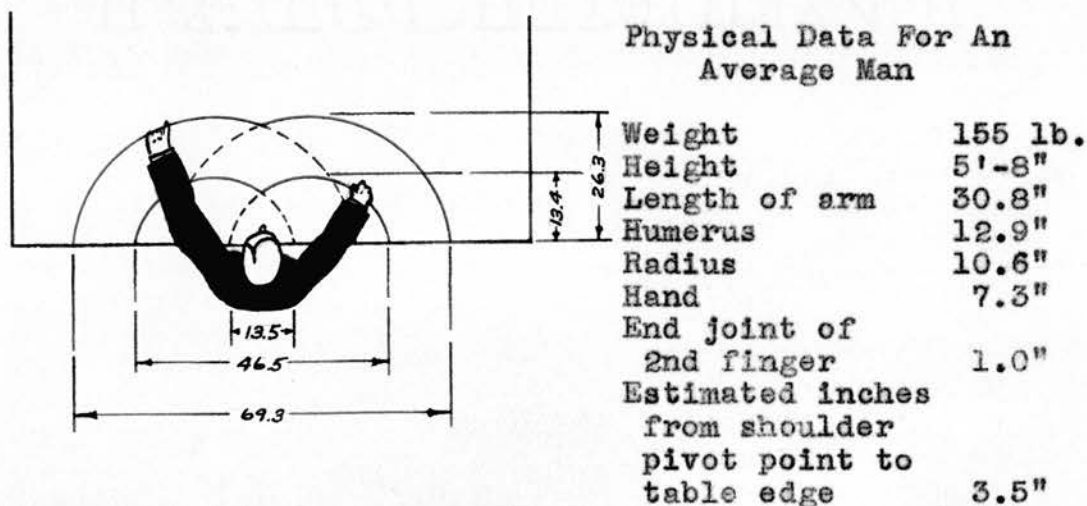
¹Barnes, op. cit., p. 15.

Chronocyclegraph. A chronocyclegraph makes it possible to record the path of motion of an operator in three dimensions. A time recording element is incorporated by putting an interrupter on the light circuit which flashes lights on and off at a uniform rate per second. The photograph shows a line of timed dashes, the measuring of which can be very accurately determined. By controlling the combination of current in the light circuit and thickness of filament in lamps, it is possible to cause quick lighting and slow extinguishing of light, making the dashes produced in the picture blunt in front and tapering toward the rear. By such means the time, speed, acceleration, retardation, and direction of the movement are photographed.

Source: Philip F. Dyer, "Training Tomorrow's Leaders," Business, July, 1950, p. 41.

A primary disadvantage to the use of the chronocyclograph--that of having to make the study in semi-darkness, has been overcome by the College of Aeronautics at Cranfield, Buckinghamshire (England). The included photograph, showing the movements (left) of a girl typing letters with standard stationery and carbon paper and (right) with continuous stationery, are the first of their type to be taken in full lighting conditions.

Working Area. In job study analysis, it is important that consideration be given to the arrangement of the working area, whether it be a group of machines,



Normal Working Areas for Arms and Hands

a room, a workbench, a desk or a table. As far as possible, the working area should take advantage of the normal working area of the operator.

Time Study. To illustrate the procedures of time study, the following actual study will be followed through step by step. A request for a study of the Poppet and Spring Seat Assembly was made by the Tank Regulator Department. The time study engineer first obtained a print of the assembly and checked it to see whether the job was being run according to specifications. Being satisfied that it was, he proceeded to fill up the portion of the Time Study Summary pertaining to part number, operator number, drawing issue, et cetera.

Special characteristics were listed under "Remarks," and a sketch of the set-up and location of stock was drawn. Next, the elements of the job were arranged on the reverse side of the form. The starting time of the study was noted in the lower right corner, and then the timing started. It will be noted that continuous timing is used. At the completion, the time was noted, and the elapsed time recorded.

Following this comes the most important part of the time study--leveling or rating the performance. Everything other than leveling can be done by anyone familiar with a time study form and a stop watch, but all the figures are meaningless unless the operator's pace is accurately judged. The Methods Engineering Council's leveling system and tables are used at the plant where the study was made. Definitions for various degrees of skill and effort are tabled, with the corresponding percentage of increase or decrease to allow for any degree of skill or effort, with 100 percent established as average. The operator studied worked at the rate of 105 percent.

This completing the actual time study, the observer returned to his office to calculate the standard. Readings were extended for each element, such extensions being shown in red on the form. The element timings were totaled and noted in the appropriate space at the bottom of the page. High and low timings were recorded in order to get an idea of the consistency of the performance. Since the total number of pieces studied was twenty-eight, each total was divided by this figure

to decide the average.

Elements were then listed on the front of the study form, and the average time for each element was listed under the heading "Average Time," this figure being multiplied by the leveling factor to obtain the allowed time. Both columns were totaled and listed.

Now under "Standard Summary," the total average time was listed and divided by sixty minutes to arrive at the number of pieces per hour the operator could run without fatigue or personal allowances. No allowances were made for stock, et cetera, because none applied or were needed for this operation.

Time allowed was noted in the space provided. This figure was multiplied by 15 percent, the percentage of time allowed for fatigue, personal time, and unavoidable delays. Adding this adjusted time to the allowed time, the engineer arrives at the total allowed time for the operation, which, when divided by sixty minutes, established the time standard for the operation.

RATING

105%

TIME STUDY SUMMARY FRONT

PART NO. 93770

OPER. NO. 30-1

FULTON SYLPHON DIV.

DWG. ISSUE D

ROBERTSHAW-FULTON CONTROLS CO.

Poppet and Spring

OPERATOR William O. Graves

PART NAME Seat Assembly

DATE 2-4-50

SERIAL Brass Spring Seat; Bronze Poppet

100 Station

MACH. NO. Jig

MACH. TYPE Circular Jig

DESCRIPTION OF OPERATION Unwrap Poppet, Flux Poppet, Assemble to Spring Seat

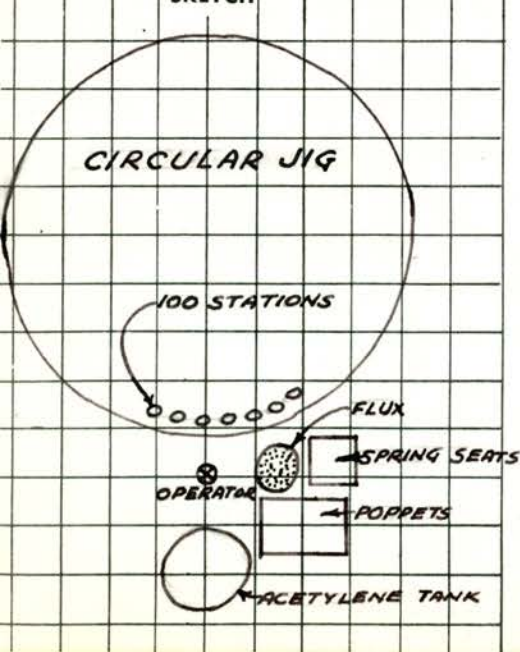
R. P. M. Hand

and Braze Poppet to Seat.

FIN. WGT -

ELEMENTS	Tool No., Speed, Feed, Etc.	Average Time	Leveling Factor	Leveled Time	STANDARD SUMMARY
					ACT. AVE .577
Place Spring Seat on Jig		.030	1.05	.032	60 ÷ .577 = 104
Unwrap Poppet		.176	1.05	.132	ACT. PCS. RUN 78
Flux Poppet (Dip End in Flux in Bowl)		.038	1.05	.040	LEVELED TIME
Assemble Poppet to Seat		.053	1.05	.056	STOCK *See Below
Light Torch, Adjust and Pick Up Solder		.016	1.05	.017	GAGE "
Braze Poppet to Seat		.774	1.05	.735	TOOL "
Put Out Torch and Lay Solder Aside		.012	1.05	.013	ADJUST "
Lay Brazed Piece Away (Pliers)		.078	1.05	.079	MISC. "
					ALLOWED TIME .554
		.577		.554	15 % ALLOWANCE
					TOTAL ALLOWED .083
					TIME .637
					60 ÷ .637 = 94
					STD. PER.
					HOUR 94
					OBSERVER <i>Hawn</i>
					APPROVED BY <i>SK</i>

SKETCH



REMARKS

Use No. 5128 Silver Solder, Handy Flux, Acetylene Torch.
Flux Applied By Dipping.

Poppets Come Wrapped in Tissue Paper to Protect Seats.

*Stock is Brought to Bench by Stock Boy.

Operator Fluxes and Assembles 100 Pieces, Then Lights
Torch and Brazes 100 Pieces.

Place Seat On Jig (28 Pos.)

Unwrap Poppet

Dip Seat in Flux

Assemble Poppet To Seat

Light Torch and Adjust; Pick up Solder

Braze Poppet to Seat

Put Out Torch and Lay Solder Aside

Lay Brazed Pieces Away in Box (Pliers)

REVERS

A	B	C	D	E	F	G	H	I	J	Totals & Etc.					
85	116	31	70	4	73	3	135	44	60	75	97	34	1476	79	*Tight
	32	9	34	7	39	5			77	17					Had to
	49	10	52	3	55	3			98	71					Poppet
	70	15	73	3	*95	72			824	76					Seat
	109	14	13	4	*75	12			42	18					
	34	9	37	3	44	7			65	73					
	52	8	55	3	60	5			85	70					
	69	9	74	5	78	4			905	70					
	88	10	93	5	97	4			75	70					
	307	10	10	3	14	4			45	70					
	74	10	30	6	34	4			69	74					
	45	11	49	4	52	3			93	74					
	65	13	69	4	73	4			1014	71					
	86	13	90	4	96	6			37	73					
	412	16	16	4	73	7			63	76					
	37	14	43	6	48	5			85	72					
	58	10	61	3	64	3			1110	75					
	81	17	85	4	89	4			33	73					
	501	12	05	4	09	4			55	72					
	71	12	74	3	78	4			78	73					
	41	13	44	3	48	4			1401	73					
	58	10	62	4	65	3			74	73					
	80	15	84	4	89	5			49	75					
	99	10	603	4	07	4			71	72					
	74	17	77	3	31	4			96	75					
	41	10	44	3	49	5			1318	72					START
	60	11	65	5	68	3			38	70					STOP
	81	13	84	3	91	7			63	75					ELAP.
															A.M.
															P.M.

A	B	C	D	E	F	G	H	I	J	TOTAL
85	3.52	1.06	1.48	.44	6.28	.34	.79			No. 6
78	78	78	78	78	78	78	78			OBSERV.
030	.176	.038	.053	.016	.224	.012	.028			AVER.
-	.31	.06	.22	-	.26	-	-			HIGH
-	.08	.03	.03	-	.17	-	-			LOW

APPENDIX H

**SAMPLE NOTICE, APPLICATION OF THE BONUS SCHEME
TO THE DEPARTMENT**

S A M P L E N O T I C EAPPLICATION OF THE BONUS SCHEME TO THE DEPARTMENT

A Bonus Scheme based on time saved will be introduced in this Department on

All operations have been, or will be, timed by the Time Study Department and time allowed will be calculated in the following way.

To the time taken by an operator working at reasonable speed two additions will be made. The first will be 33.1/3% of the observed time, and the second will be on overall rest allowance which will compensate for break periods and normal personal needs. An operator working at reasonable speed should, therefore, save not less than 33.1/3% of the allowed time and consequently would earn not less than time and one-third.

The following rules will be observed in the application of the new systems:

- (a) Excepting where the times given are definitely stated to be provisional they will not be altered unless method, equipment or shop layout or services are modified.
- (b) Any operator has the right to request that his job be re-timed if he is unable to earn satisfactory bonus, but it must be clearly understood that when a job is re-timed at the request of an operator the previous time allowed is cancelled and the new rate may increase or decrease the time allowed previously.
- (c) Waiting time, resulting from causes beyond the operator's control will be booked separately and paid at basic rate.
- (d) Bonus will be calculated daily and on the individual performance of each operator. Operators will be notified of bonus earned each day on the afternoon of the day following.

- (e) Average times for operations have been arrived at as a result of a large number of studies and details of work to be carried out, and time allowed appears in the Work Specification of the job. The Shop Inspectors will check all work: faulty work will be rectified without additional time being allowed. It must be realised that the maintenance of a high standard of quality is essential, and if the application of bonus results in a continued high percentage of scrap, the Management reserves the right to withdraw the Scheme. Subject to this important proviso, there will be no upper limit to the bonus which may be earned.
- (f) As at present all operators will be guaranteed payment at their basic rate, plus such allowances as are customary for overtime, whether time is saved or not.

GENERAL:

The whole object of the scheme has been to arrive at a fair means of payment by results and earnings under the scheme should be greater than at present.

Success naturally depends on the sincere co-operation of all concerned, and any individual cases of difficulty will receive consideration.

(Signed).....

General Manager.

APPENDIX I

DOLLAR-STERLING CONVERSION TABLE

DOLLAR-STERLING CONVERSION TABLE

\$2.80 (Official Exchange Rate)							
Cents	£	s.	d.	Dollars	£	s.	d.
1	--	--	1	1	--	7	1-3/4
2	--	--	1-3/4	2	--	14	3-1/4
3	--	--	2-3/4	3	1	1	5
4	--	--	3-1/4	4	1	8	7
5	--	--	4-1/4	5	1	15	8-3/4
6	--	--	5	6	2	2	10-1/4
7	--	--	6	7	2	10	0
8	--	--	7	8	2	17	1-3/4
9	--	--	7-3/4	9	3	4	3-1/4
10	--	--	8-3/4	10	3	11	5
20	--	1	5	20	7	2	10-1/4
30	--	2	1-3/4	100	35	14	3-1/4
40	--	2	10-1/4	1000	357	2	9-1/2
50	--	3	7				
60	--	4	3-1/4				
70	--	5	0				
80	--	5	8-3/4				
90	--	6	5				